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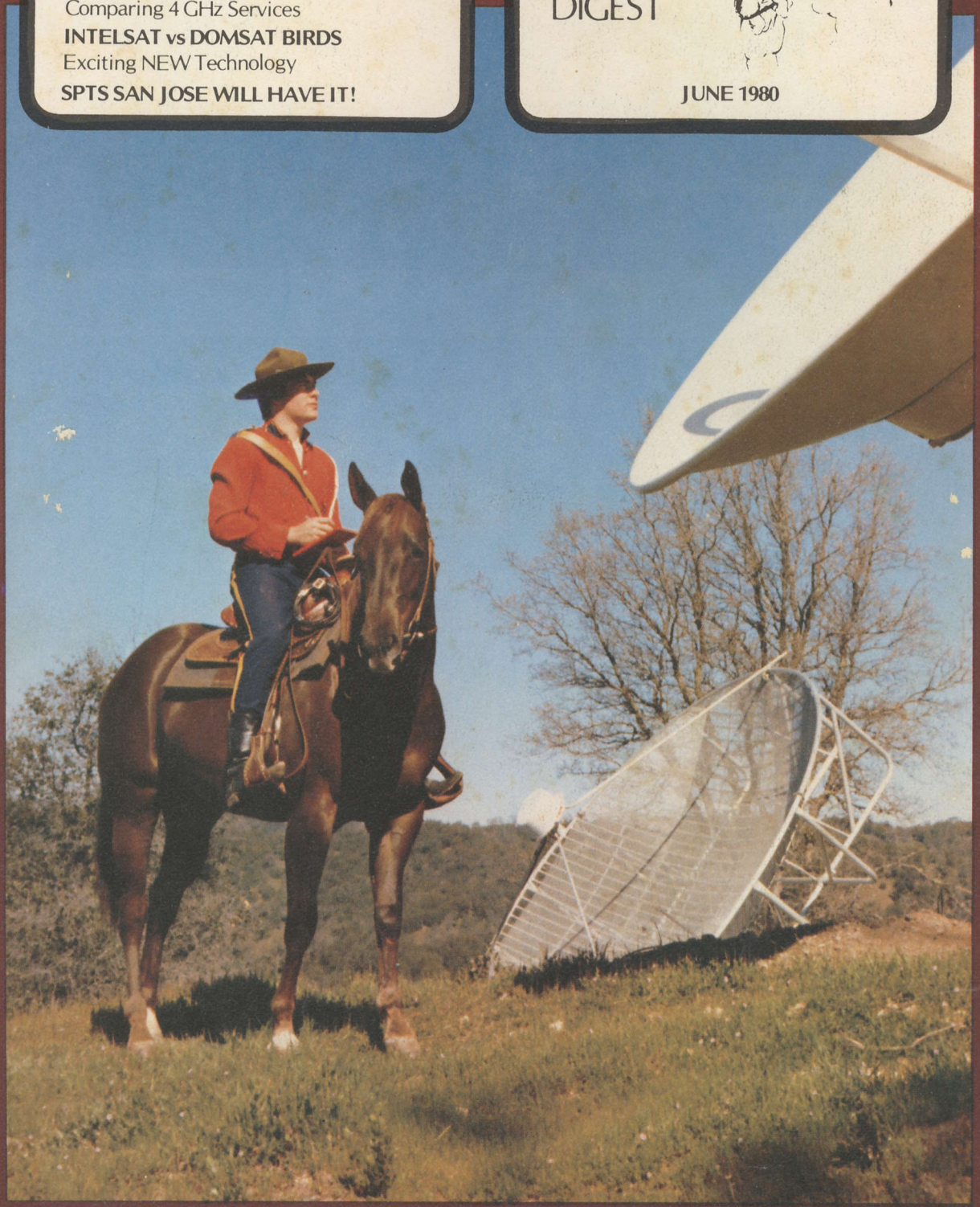
COOP'S SATELLITE DIGEST

JUNE 1980



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COOP'S COMMENT ON TECHNOLOGY

BEING OUR NEIGHBOR

It must be very trying to be a 'neighbor' to the United States. With the exception of Canada where there is a comparable standard of living the 'overwash' of American communications constantly reminds those who live nearby that we have more than they do, are more advanced in technology than they and generally have more liberal humanistic policies than they.

Canada presents a special case. Perhaps because there is a comparable degree of freedom and political development and economy in our northern neighbor there is also that temptation to 'keep up with the Joneses'. Or where circumstances allow, put the Joneses in a spot where they are playing catch up.

All of this is strongly evident in the satellite business. Let's look at Canada. Because of the peculiar spread of US geography Canada is sort of sandwiched in between our state of Alaska and the 48 lower states. For US satellites to properly serve both ends of the Alaska + 48 equation at 4 GHz Canada is caught in the middle. That works out well if you are in Canada and wish to enjoy US (satellite) television since in the process of serving the two extremes we place a strong footprint over most of Canada.

Because of ANIK and because of the special circumstances presented by Canada's far north (where few people live spread over a large area) the Canadian experiments with satellite relay of television in many ways pre-dated the US efforts and technology. Canadian pioneer Rod Wheeler for example (see separate report in this month's Programming Section) possibly was up and active with his Yukon terminal prior to even Taylor Howard's efforts here in the states. But whereas Taylor was interested primarily in his own private experimentation Rod Wheeler was motivated because his Yukon community needed live television service. Taylor went 'undetected' for several years while Wheeler's first terminal was shut down by the authorities after three days operation.

With justification the Canadian technologists are proud of their pioneering efforts with ANIK. They did it first and that must be acknowledged. But then having done it, they then proceeded to fumble the ball because they couldn't figure out what to do with it! Today they still can't figure out what to do with it (ANIK).

In attempting to protect their own sovereignty and their own industry, and to control this overwash of US satellie programming, they have adopted a number of protectionistic policies. Here is **one** of the strangest and it illustrates the steps a nation will go to in attempting to retain its own national interests.

There is a single manufacturer of LNAs in Canada; a firm called SED in Saskatoon. They turn out between 10 and 20 120 degree K LNAs each month. With the rapid growth of private terminals in Canada it was soon apparent that SED could not supply the marketplace (and furthermore they were more comfortable selling only to the ANIK-trust so in fact made no effort to sell to private terminal operators). Soon US manufactured LNAs were crossing the border into Canada. Virtually all of the US manufacturers of LNAs now have multiple dealers and even a few stocking distributors in Canada.

Now when an LNA quits (as LNAs are apt to do) it must be repaired. If the unit is under 'warranty', the purchaser naturally wants to return it to the manufacturer for no-charge repair. But if the manufacturer is in the states, the Canadian authorities tell the purchaser he cannot return it for warranty repair unless he is willing to **repay the 20-25% duty** applicable when it comes back. The duty is charged on the original **new** price of the unit, irrespective that the second time across the border it was second hand and that there was no new sale here. "Too bad" say the Canadian border authorities "but our policy book here lists SED in Saskatoon as a Canadian supplier of this unit and you should have bought from them in the first place; then you wouldn't be having to pay this double duty". That SED cannot produce enough to satisfy the market and that they virtually refuse to sell to private terminal users makes no difference.

It is all simply more red tape created by a bureaucracy as an effort to retard the growth of private terminals in Canada. What's a law abiding Canadian to do? Certainly he is breaking at least the policy if not the law when he sets out to view US satellite signals. Then he is forced by the idiocy of the bureaucracy to become an equipment smuggler when his non-commissioned private terminal breaks down and he needs some expert factory repair to get it operating again.

For every action they say there is an equivalent reaction. A pity it is that the Canadians had the foresight to start the domestic satellite service evolution and then having started it could find no way to control what they began. A double pity that Canada has chosen to 'fight back' what they apparently cannot control by indulging in petty bureaucratic red tape war manuevers which only force their own people to adopt yet more illegal tactics to maintain an even keel.

It is with this bureaucratic pattern in mind that we re-draw your attention to this month's cover. Created and conceived by the 'with-it' wife and partner of US satellite pioneer Tay Howard, **Annie Howard says it all** in a simple photograph. One Mounty, ticket book in hand, astride his trusted steed writing out a summons for the hapless owner of a private TVRO terminal. The crime? **Watching television!**

CSD TECHNOLOGY

COOP'S SATELLITE DIGEST (Technology Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P. O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere.

SINGLE CONVERSION APPROACH # ONE

There is no question that the world of 4 GHz is different from say the worlds in the VHF region and many otherwise experienced technicians and engineers find themselves groping in the dark a bit when they set out to construct their first active working, 4 GHz range circuit.

Norman Gillaspie went through this learning curve on his own more than a year ago, starting with the popular Howard and Coleman manuals, and slowly in his mind a system evolved which he felt suited his needs. Subsequently his system has been made available (as circuit boards and parts) to others. This report details his single conversion, high quality front end that will get you from 3.7/4.2 GHz down to 70 MHz in a hurry with good efficiency and outstanding performance. Coupled with other material in this issue of CSD, you may decide that this is a good way to go for either a tuneable single conversion TVRO or a low cost ARO (audio receive only) terminal.

Gillaspie's initial incentive for this project came from the long lead time associated with obtaining the Vari-L DBM500 mixer device. His answer was to create a stripline mixer that requires no tuning with the following specifications:

1] Input 3.7 to 4.2 GHz, flat to + /-1 dB
2] Output at a center frequency of 70 MHz (plus or minus 15 MHz) with a gain variation of no more than + /-0.5 dB
3] Total conversion gain (the system includes a 70 MHz IF) of 20 dB minimum

The particular Gillaspie Stripline Mixer described here has on-board provision for 'snapping in' an Avantek 8360 VCO (local oscillator) although an off-board VCO could be used and coupled in with an SMA fitting or hard wired with coaxial cable.

The Stripline circuit is constructed on Diclad 527 Teflon material (on .031 thick dielectric with 1 ounce copper on both sides) and **no substitution** of this material is recommended unless the builder is prepared to make stripline adjustments to 'compensate' for the differences in board dielectric constants.

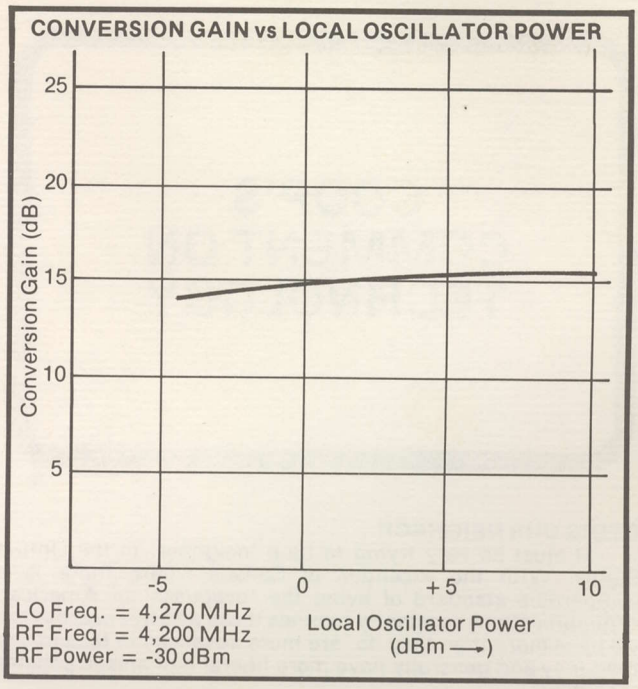
There are three circuits on the board; a mixer, an oscillator and a 30 dB gain (IF) block. Looking at the mixer portion first (see circuit board prints here):

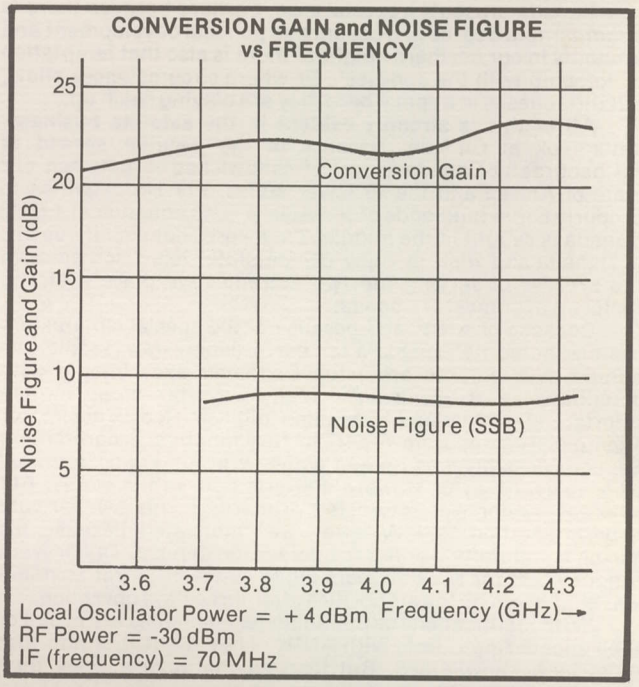
1) **Mixer** - The printed circuit line marked RF is your connection from the LNA to the mixer. An SMA fitting is soldered to the **bottom** of the board (remember this is to be double sided board) as well as the top. The signal is connected to a 1½ wavelength line which is designed to **cancel** the LO signal at the input and output ports and re-enforcing the signal at the mixer diode ports. The twin diode mixers and their placement around the ring are the other two ports. Notice the 'boomerang-shaped' twin inductors inside the ring; we have a 4 GHz low pass filter here.

Also note the thinner etched inductors which lead to a pair of pads that couple through wire jumpers to the output line. This line combines the output from both diodes. Also attached on this line is a 3.3 uH choke in series with a .001 UFD capacitor paralleled by a 10 ohm resistor. This network forms a low pass filter producing a convenient test point to determine if the LO is working or whether you have blown a diode.

Local oscillator injection comes into the classic rat-race ring via the remaining connection marked LO. This line has a ¼ wavelength line attached to it which shorts to the ground plane on the bottom of the board. This is the DC return for the mixer diodes.

The recommended VCO is the Avantek 8360 which requires a 15 VDC supply for oscillator operation plus a 11 to

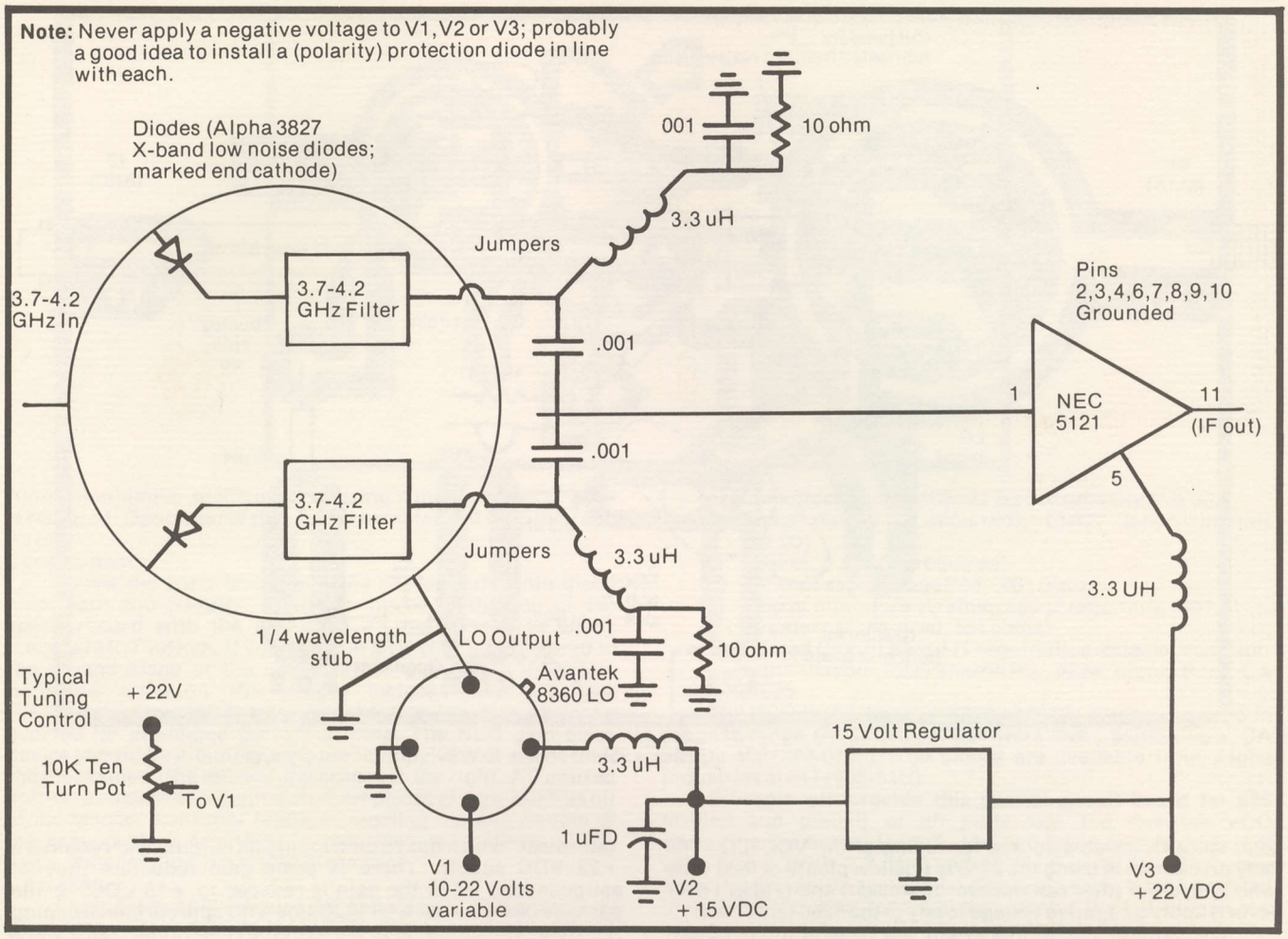


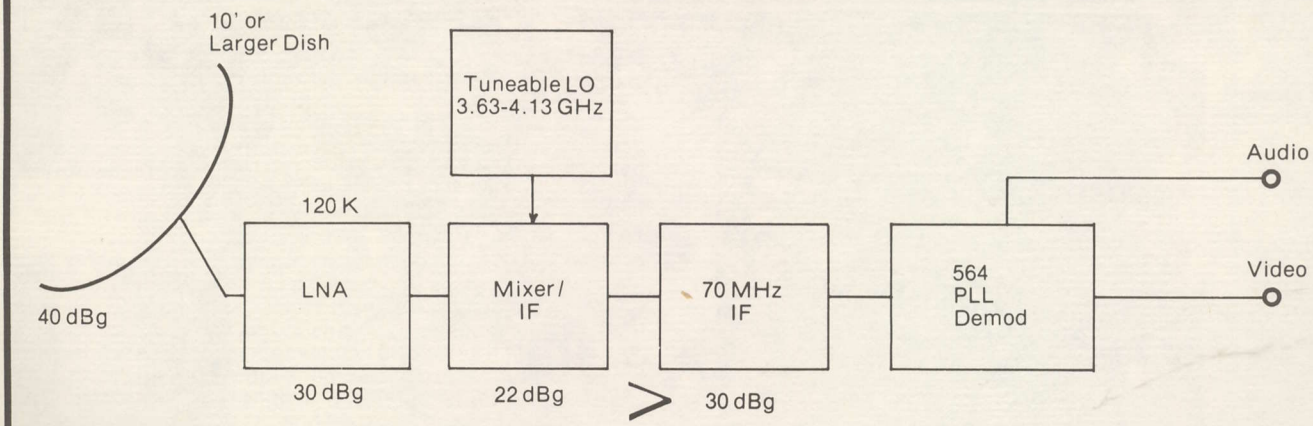


Prepared from Material Submitted by:

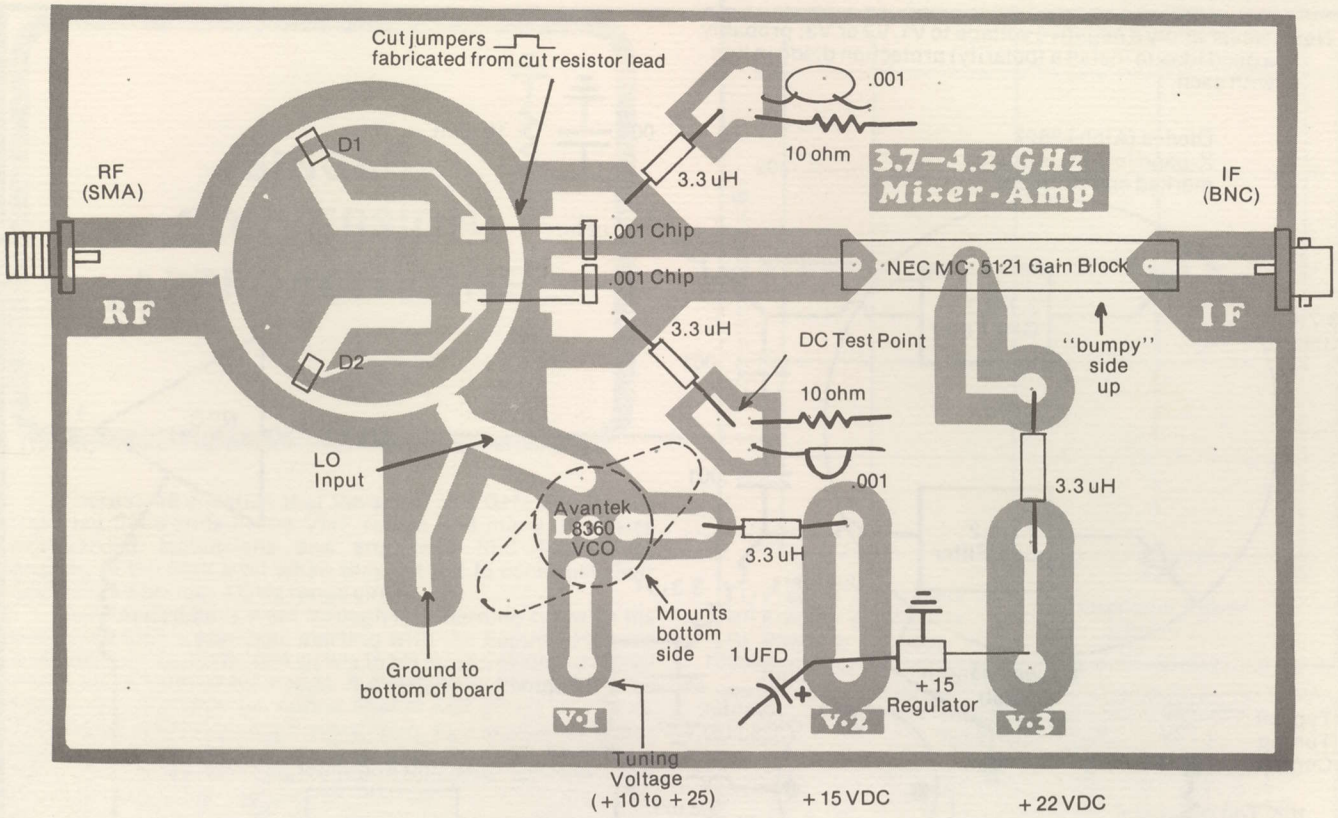
Norman Gillaspie
2225 Sharon Rd., #224
Menlo Park, CA 94025

Note: Never apply a negative voltage to V1, V2 or V3; probably a good idea to install a (polarity) protection diode in line with each.



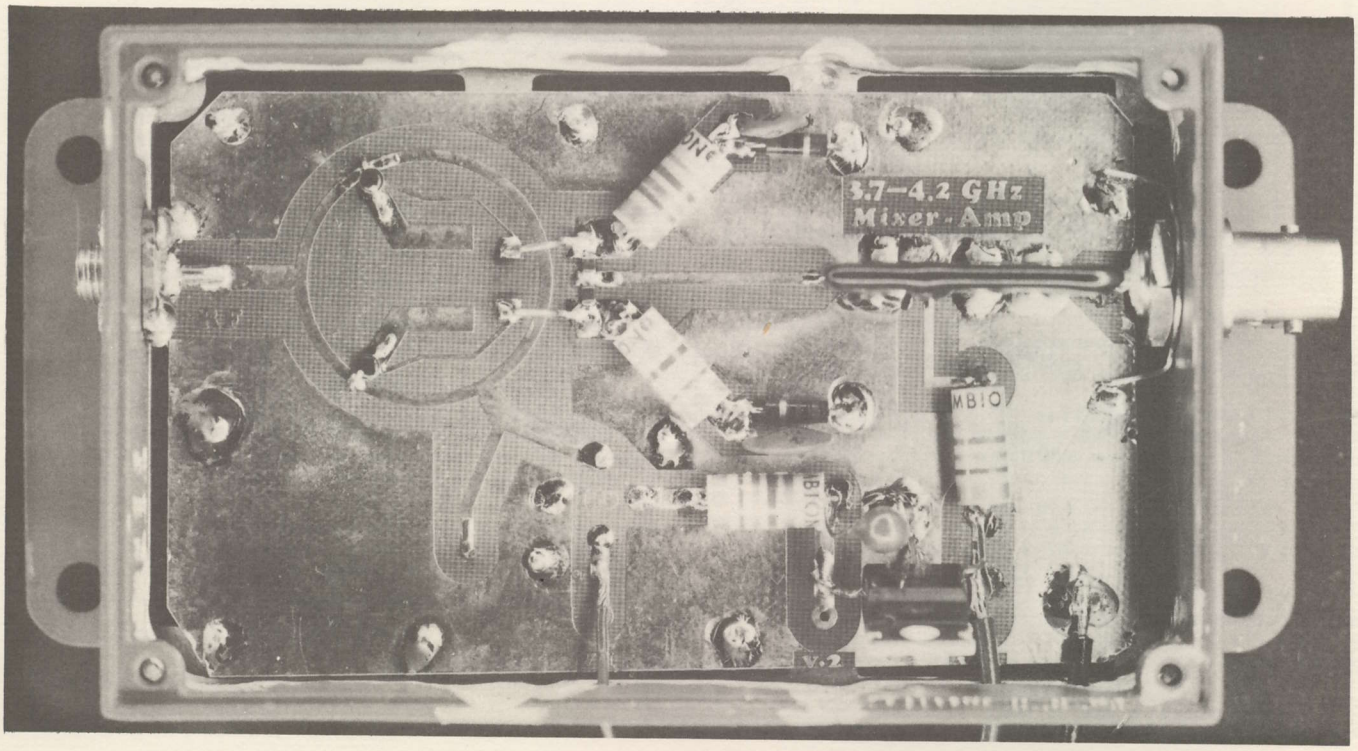


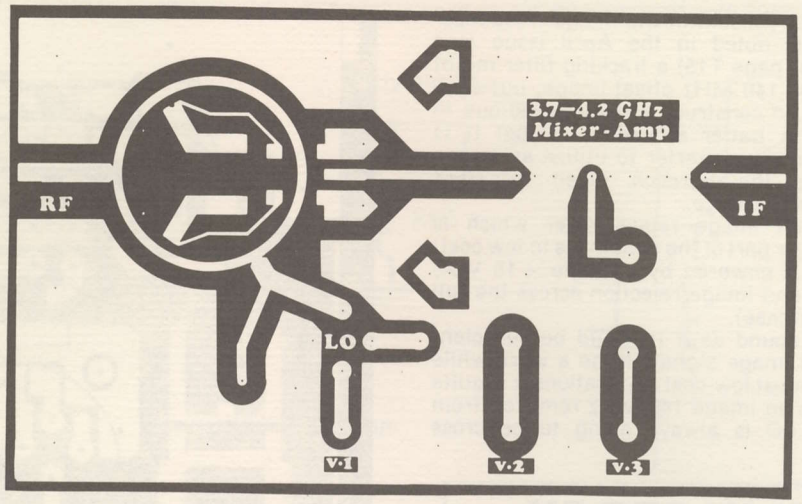
GILLASPIE RECOMMENDED SINGLE CONVERSION SYSTEM



22.0 volt DC variable source for tuning of the VCO/LO. The only precaution in using the 8360 is [1]allow plenty of lead time when you order (they can run over 12 weeks!) and **[2]don't ever** (ever!) apply a negative voltage to any of the 8360 terminals.

The output stage of this sytem is a 75 ohm input/output 'gain block' which has 75 ohm input and outputs and requires a +22 VDC supply. There is some gain reduction (but not astronomical) when the gain is reduced to +15 VDC, or the package could run off a 24 VDC line with appropriate dropping resistors. The output is to the extreme right of the board and a





connection similar to the input utilizing either an SMA or BNC is required. Operation of the unit is characterized here in graph form.

Construction

Follow the parts layout and the photograph; note diode placement and polarity. All parts mount to the top of the special board with the exception of the LO source which mounts to the bottom. If you wish the VTO could be **soldered** to the ground plane of the board rather than using mounting hardware although this would increase the problems associated with replacement and heat to the case is to be avoided for prolonged periods of time. The NEC gain block device should be mounted with the 'bumpy' side towards you, the input side to the left and the output to the right. All unused holes are soldered through with short pieces of wire (such as off of the resistor/capacitor leads) connecting top and bottom of the ground plane together. In mounting the balance of the parts, simply follow the layout given here.

Operation

Apply the supply voltages (V2 and V3 on board) and adjust the tuning voltage applied to the 8360 (V1) to approximately 17 VDC. This should place you in **mid-band** near 3950 MHz. As per the system block diagram, you would have around 52 dB of gain (electronic; plus 40 dB passive antenna gain) up to the output of this mixer portion of the system. To go the rest of the way you need to pass from the output of this board into an appropriate 20 to 30 MHz wide IF passband filter and then into an additional IF gain stage (30 dB or so recommended). This should get you into the right ballpark to hit a phase lock loop demodulator with around 0 dBm.

For the record, in a single conversion receiver a local oscillator (the 8360 or suitable substitute) and a mixer (the Alpha diodes in the rat race scheme) receive the selected satellite transponder (found by varying the 11-22 volt tuning voltage on the 8360) and convert it down to the 70 MHz IF. All single conversion mixers have some degree of image problems (see 'Image Rejection Single Conversion Mixer', this issue of **CSD**) and a phase lock loop demod minimizes (but does not eliminate) this image effect. If the downconverter is properly designed as this one is, there should be no detectable amount of signal distortion in the conversion process.

One of the more appealing parts of this package is that because the IF output range is 'unfiltered' at the output of this portion of receiver design, and because the costs (the Avantek 8360 aside) are rather minimal, the downconverter-tuner could be used to drive directly into a higher IF in the 88-100 MHz region utilizing a standard FM tuner/receiver as an IF. This would allow you to recover audio-only transmissions where they are transmitted as descrete FM carriers via the bird for a minimal investment in the receiver (see separate report this issue of **CSD**).

SINGLE CONVERSION MIXER - Parts List

The following parts are required for construction of the Gillaspie single conversion downconverter plus pre-IF amp:

a) **Gain Block**, NEC MC5121 (approximately $13.00)
b) **Alpha diodes** (2 required), D5827 (approximately $25.00)
c) **Chokes**, 3.3 uH (4 required)
d) **Ceramic caps** (2 required, .001 disc)
e) **Chip** or miniature ceramic caps (2 required), .001
f) **Resistors** (2 required, ten ohms)
g) **Printed Circuit Board** (1 required), available from Norman Gillaspie, 2225 Sharon Rd., #224, Menlo Park, CA 94025

The VCO is the Avantek 8360 and it is currently priced in the $115 range (Avantek, 3175 Bowers Ave., Santa Clara, CA 95051; 408/249-0700). The diodes are available from Alpha Industries at 617/935-5150.

Gillaspie will provide this special circuit board for $35 (drilled and plated) or all parts less the Avantek VCO (including the board) for $75. He also has a two-stage Birkill LNA board (with 2.2, 4.7 and 1000 pF chip caps); anyone ordering the single conversion downconverter board detailed in this report during June will also receive the two-stage LNA board as a 'free' bonus. Gillaspie is scheduled to appear on the SPTS '80 San Jose technical program so those who are looking for hard answers to LNA and down converter problems should start preparing their question list now!

SINGLE CONVERSION APPROACH # TWO

One of the primary disadvantages for the single conversion (TVRO) receiver operating in the 3.7 to 4.2 GHz

Prepared from material submitted by:
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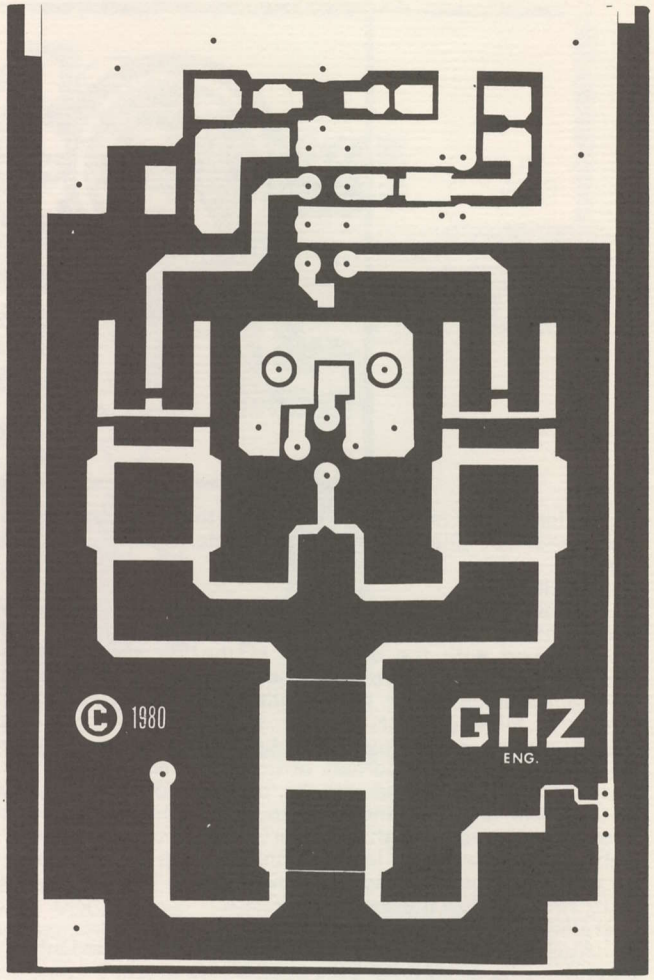
Phoenix, AZ 85067

downlink range is the noise present in the image 'response' frequency range. As **CSD** noted in the April issue (see Technical Correspondence, page T15) a tracking filter might be employed to remove the 140 MHz offset image; but such filters are very expensive to construct and more tedious to implement and tune-up. A better approach, in that it is simpler, is to design the downconverter to utilize an image rejection mixer. This is the approach taken by GHZ Engineering's 'Superverter' package.

The Superverter is an image reject mixer which is intended to provide the major part of the simple (as in low cost) TVRO receiver. The unit is powered by a single +15 VDC supply (at around 80 mA) and image rejection across the full band is at least 10 dB (worst case).

Now 10 dB may not sound as if it would be sufficient rejection of the unwanted image signals to be a worthwhile effort. It turns out that for most low-cost applications it is quite enough rejection. Because an image 140 MHz removed from the desired transponder LO is always going to be cross

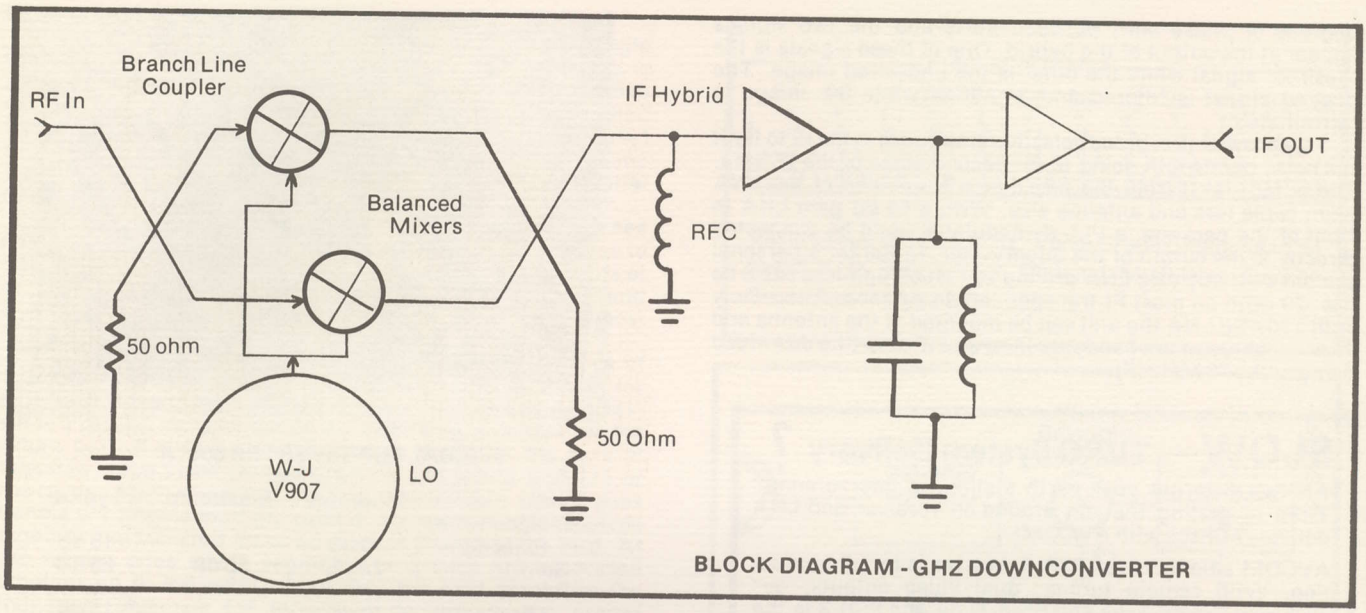


polarized (SATCOM/COMSTAR; i.e. transponder 12 center frequency is 3940 MHz while 70 MHz **below the LO** operating at 3800 MHz is transponder 5) **or between** transponders (WESTAR/ANIK; i.e. transponder 8 center frequency 4000 MHz, LO at 3730 MHz, lower image at 3660 which falls between transponders 4 and 5). In the case of SATCOM and COMSTAR, the cross polarization difference is itself in excess of 20 dB worst case and more typically 25 dB. In the case of linear-horizontal birds the image falls squarely in between transponders where there is very little modulation present. Any that is present is going to be down far more than 30 dB.The concern then is with the 'noise' present, not the RF energy.

Rejection of 10 dB of noise typically works out so rejection of almost as much noise as the typical Carrier to Noise ratio (C + N to N) runs on the deisred transponder; a typical small terminal system runs a C + N to N in the 11-13 dB range maximum. Therefore while not every bit of additive noise may be rejected in an image rejection mixer, the amount remaining contributes an insignificant degradation (approximately 1/10th dB) to the desired transponder C + N to N.

(It should also be noted that when two or more receivers are to be utilized with a single LNA and one or both of the receivers are single conversion the presence of the receiver(s) LO(s) leaking backwards into the LNA can cause very severe problems. The solution to this is to install isolators on the input to the receiver(s) and use proper hybrid power splitters to drive the separate receivers. This warning is primarily applicable to **multiple receiver installations** and should **not** deter single receiver systems from seriously considering this approach.)

In the GHZ Superverter the input impedance is 50 ohms through an SMA connector. The input line from the LNA will typically be very short since one of the potential advantages of this approach is that the downconversion portion of the



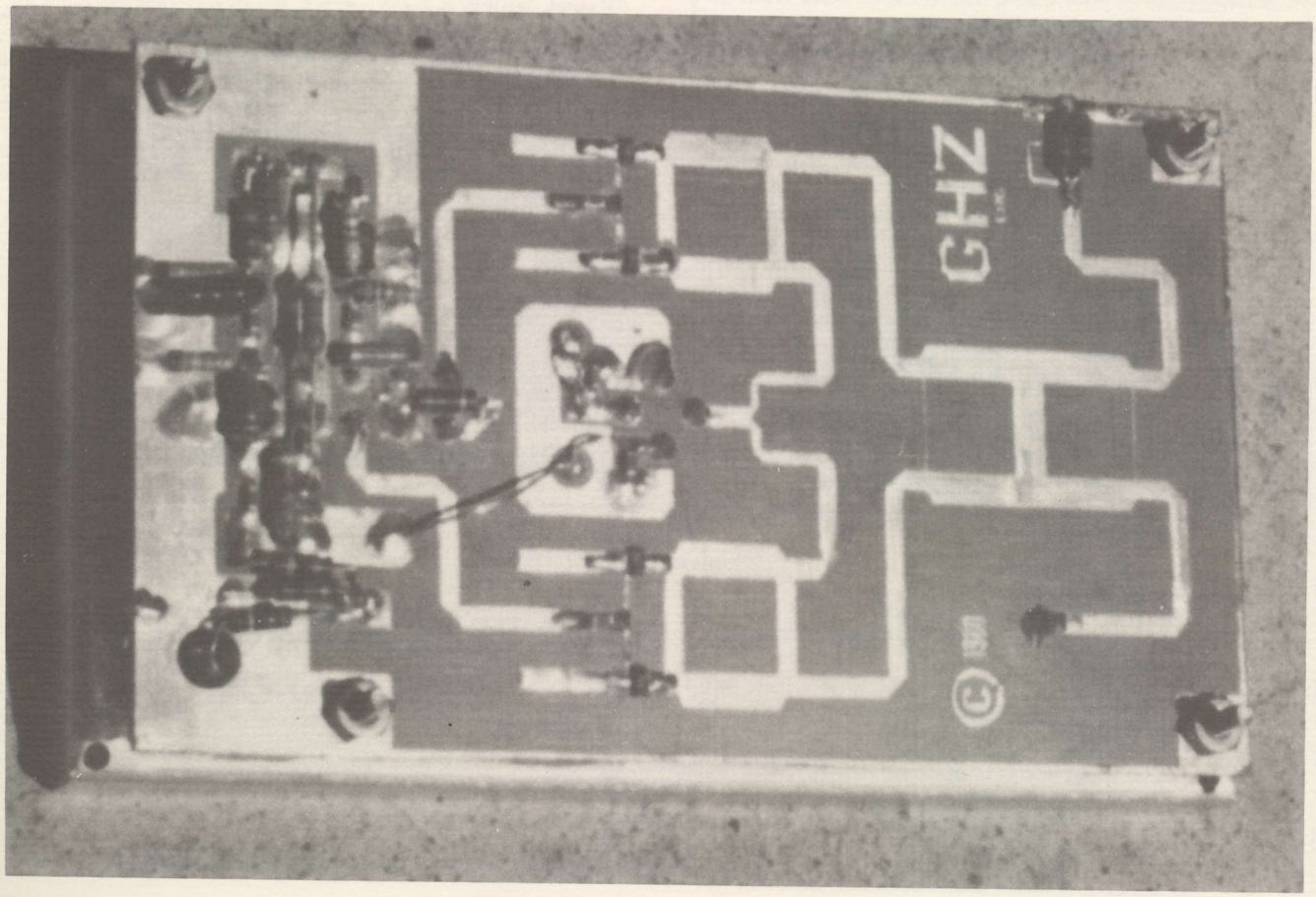
BLOCK DIAGRAM - GHZ DOWNCONVERTER

package can be located outdoors at the antenna (feed). If the installation wishes the Superverter indoors it would simply be at the indoor end of the (normal) downline from the LNA. The Superverter has two stages of IF gain following the image rejection mixer. The total package gain is around 25 dB.

The LO in the Superverter is a Watkins-Johnson V901 or a W-J V907 device. The required tuning voltage can be sourced from a +15 VDC supply through an AFC circuit in the receiver. Without an AFC, a 2K pot in series with the +15 VDC line will allow tuning of the LO.

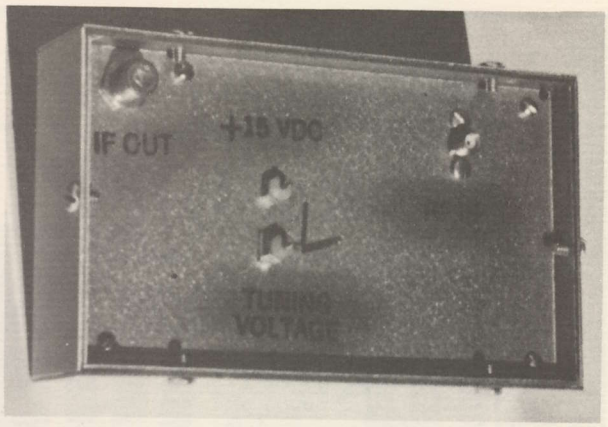
The mixer approach is the same one finds in a phasing type of single sideband exciter. The RF input signal is split into a pair of equal signals; each 90 degrees out of phase with the other. These signals are mixed in a pair of single balanced mixers with the LO source from the W-J unit. The LO is fed in phase to the pair of mixers. As you can determine from the photo and PC board layout appearing here, the mixers and power splitters are etched on a (glass Teflon) circuit board.

The IF signals, one from each mixer, are combined in an IF hybrid coupler from Mini-Circuits. The IF hybrid also has 90



degrees of phase shift between ports and the two signals appear at the output of the hybrid. One of these signals is the 'desired' signal while the other is the undesired image. The desired signal is filtered and amplified while the image is 'terminated'.

One low-Q (i.e. broad selectivity) circuit is in the IF to limit the noise bandwidth going to the second stage of the IF amp. The output level from the package is a function of the LNA gain, cable loss and antenna size. **With a 50 dB gain LNA** in front of the package, a PLL demodulator **could be** connected directly to the output of the Superverter. In Barker's personal system with a 50 dBg LNA driving 25 feet of high-loss RG-8 he has -20 dBm on most FI transponders in Arizona. Alternately with a 30 dBg LNA the unit can be mounted at the antenna and 75 ohm cable run to a bandpass filter and IF amp (the downfeed being at the 70 MHz IF).



TYPICAL SUPERVERTER DATA

	Minimum	Maximum	Typical
Image Rejection	10 dB		15 dB
Gain	22 dB	30 dB	25 dB
Return Loss Input	10 dB		15 dB
Return Loss Output	12 dB		20 dB
Noise Figure		13 dB	10 dB
LO Tuning Voltage	0 VDC	20 VDC	1-8 VDC

The noise contribution from the unwanted image (response) using the Superverter image-rejection approach will typically be 1/10th dB.

The output of the Superverter is 40 MHz wide (at the 3 dB points) and centered at 70 MHz. With 25 dB of IF gain **at 70 MHz** several hundred feet of low-cost RG-59 cable could be run from the remote mounted downconverter to the balance of the IF and a demodulator inside. The 'light filtering' in the unit is really not adequate for single channel processing nor was it intended to be; a 70 MHz 25-30 MHz standard bandpass filter should be installed in the IF segment that follows the Superverter.

The Superverter circuit board is mounted in a container (3'' x 5-1/2'' x 4-1/4''). When mounted outside the box is suspended with the cable connectors down. It is suggested that power be left on thereby producing some heat within the box to prevent moisture buildup inside of the container. For difficult climates additional box weatherproofing would be required. For example, for very cold or damp climates a 'load' resistor inside the box would supply additional heat. When the unit is used in conjunction with a 50 dBg LNA probably the best location for the Superverter is inside.

A PRELIMINARY LOOK AT AROs

HIDDEN AWAY

The 40 MHz wide transponder which brings you a single channel of video plus one or two or three aural sub-carriers is also capable of handling (in place of the video) more than 900 (one way) voice/data channels utilizing a technique called frequency division multiplexing (FDM-fm),or, 500 (one way) single channel per carrier /SCPC signals (fm-FDMA). Or the transponder could handle 60 megabits per second of digital data.

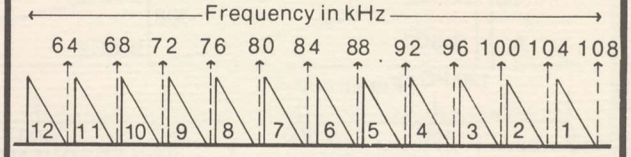
As you tune through the transponders, even when you see **no video**, chances are that as you tune through what appears to be a 'blank' (i.e. no video present) transponder there are lots of communication channels there none the less. On WESTAR and SATCOM birds, and on COMSTAR D2 and D3 there is almost no such thing as a transponder with **nothing** on it.

The FDM-fm signals are sent as groups or packages of channels. Typically one transponder is utilized on a bird for east-west transmission paths (i.e. New York to Los Angeles) while a second transponder on the same bird is utilized for the return path (i.e. Los Angeles to New York). In the case of telephone-type voice communications you would find 1/2 of the conversation on each of the two transponders. Uplink sites bundle or combine multiple voice or narrow band data sources together and transmit these bundles or groups to the bird. At the receive sites whole segments or groups are processed together up to the point where they are split apart into the individual channels for terrestrial delivery to the proper receiving point.

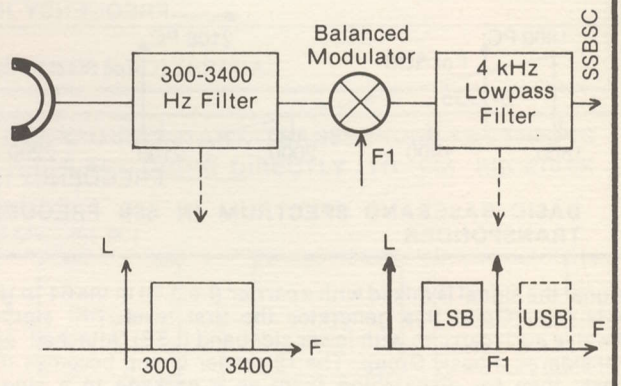
The SCPC / fm-FDMA signals are handled going to the bird as descrete uplink signals; a site may have just a single audio/data channel winging towards the bird utilizing a relatively low power (i.e. 700 watt) uplink transmitter into a relatively small (i.e. 4.5 meter) uplink antenna. A single transponder may have dozens (or even hundreds) of separate or descrete SCPC channels passing through it; each under the separate control of its uplink operator.

Because the SCPC approach involves the transmission of descrete carriers or signals the uplink transmitter can be portable and be moved as required by the service. In effect, the small uplink station is boresighted to the bird, a check is made to insure that the selected uplink frequency is 'clear' and the station starts talking. The satellite treats the uplink signal just as it would any other; turning it around and sending it back down again. The primary advantage to SCPC is that the station can be relatively simple, which means less expensive, and it can be moved about as needed.

Alternately the FDM-fm uplinking is more appropriate at a major center where dozens of separate signal sources can be converged to an uplink station, combined utilizing the multiplexing techniques, and then sent as a group onto the bird. The same efficiency of scale applies at the downlink sites; if a group of 12 users, all communicating between Los Angeles and New York say are combined into a basic 'Group' for uplink processing, at the downlink site the same Group is received and processed as a group, without demodulation to baseband and then carried via terrestrial circuits into the heart of the city where individual leased or radio circuit lines finally connect the then demodulated signals to the appropriate points of communication. In the FDM-fm system the satellite operator acts like a telephone-company-in-the-sky routing 'packages' of communication channels around and about. In the fm-FDMA approach, each voice or data channel requires custom patching or connection to insure that once the SCPC signal is into the bird there is somebody on the opposite (terrestrial) end to hear it and talk with it.

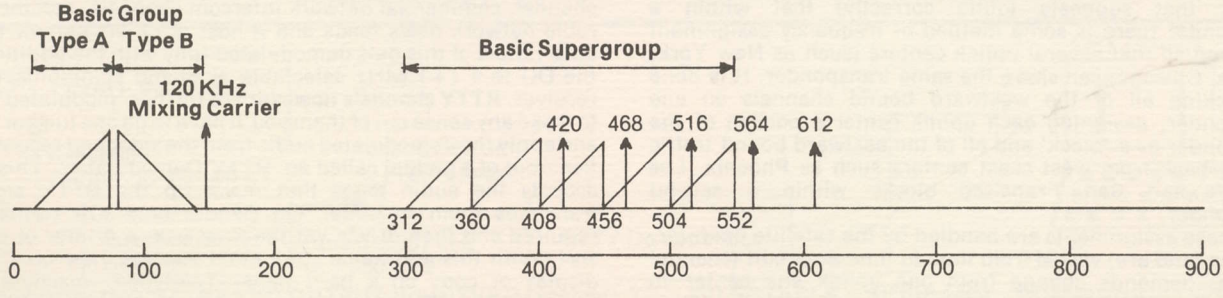


Basic Group of 12 ''4 KHz''Voice Grade Channels in 64 to 108 KHz Range; Each Channel Modulates Carrier Separately. (Type B Group)

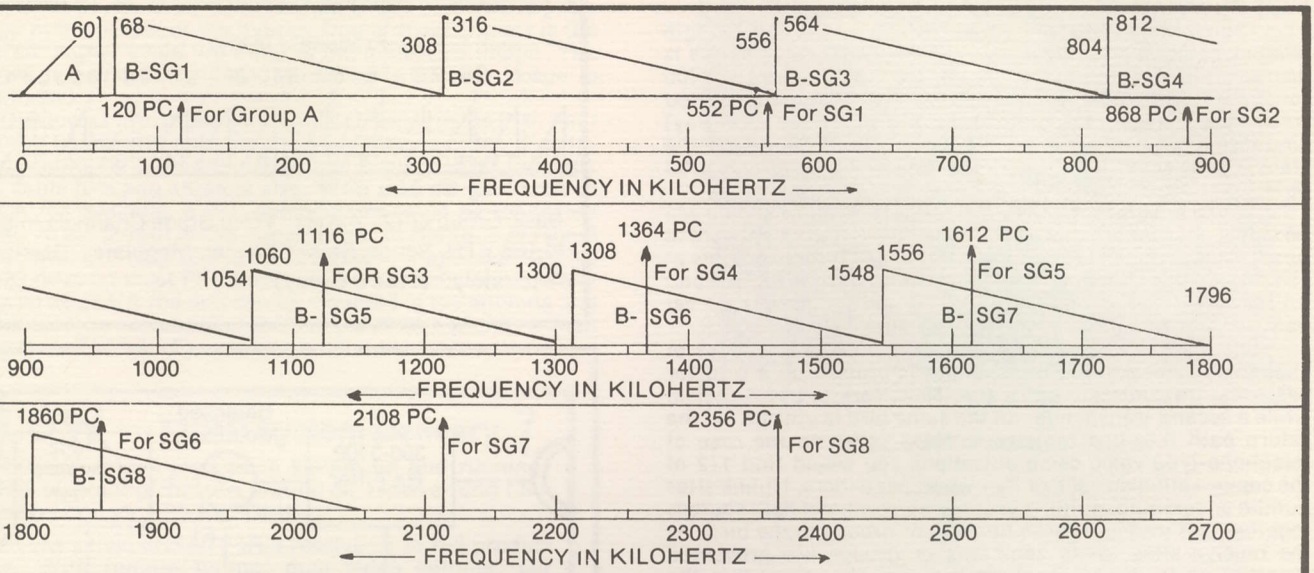


LOWER SIDEBAND AUDIO SIGNAL IS GENERATED IN BALANCED MIXER AFTER 300-3400 Hz PROCESSING

The typical voice or low grade data channel is 3.1 kHz (3100 Hz) wide **as shown here**. A bandpass filter cuts off all information below 300 Hz and above 3400 Hz leaving intact the normally most useful voice communications spectrum. This bandwidth is then applied to a balanced modulator device which (with appropriate filtering) results in a lower sideband (SSB) signal. After being converted to a lower sideband **audio**



GROUPS vs SUPERGROUPS



BASIC BASEBAND SPECTRUM IN SSB FREQUENCY DIVISION MULTIPLEXING ON TYPICAL SATELLITE TRANSPONDER

signal the signal is mixed with a carrier (i.e. LO) in the 64 to 108 **kHz** region and this generates the first level 'RF' signal. Twelve such carriers with lower sideband (LSB) 'attached' are considered a basic **Group**. The 12 carrier Group becomes the basis then for dispatching them as a **package** to a single intended receiving terminal. They will remain together, in the 'RF' region between 64 and 108 kHz, until they near their final individual destinations. Demodulation back to the basic audio range (300-3400 Hz) will only take place when the actual delivery circuits are approaching.

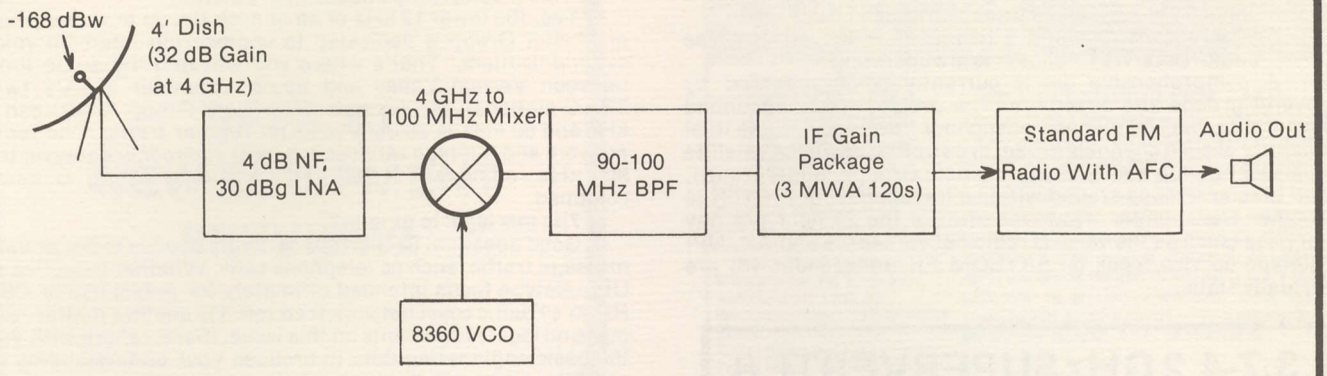
The 12 channel package is a convenient way to get 'packets' around and about but it is nothing more than a basic building block. However with as much satellite relayed traffic as there is these days it becomes necessary to build upon the basic Group and for this there is the **Supergroup**; a combination of **five** basic Groups. If a basic Group contains 12 separate carriers a Supergroup will contain 60. Again, we have a 'package' of channels which can be processed all together and kept intact up to a point of final destination and delivery. But sometimes 60 circuits between two major centers is not enough so there must be something larger; it is the **Mastergroup**; a combination of five Supergroups. A Mastergroup has the capacity for 300 circuits or channels between any two locations. Yes, it can go on from there but at the present stage of growth Mastergroups seem capable of handling the needs between even the two largest message centers; Los Angeles and New York.

Now since a single transponder may be utilized for 900 or more separate FDM-fm voice-grade channels, and since it appears that no single message center such as New York is commonly utilizing more than the 300-channel Mastergroup packet, that suggests (quite correctly) that **within a transponder** there is some method of frequency assignment employed so that several uplink centers (such as New York, Atlanta, Chicago) can **share** the same transponder. It is done by stacking all of the westward bound channels on one transponder, assigning each uplink center **a portion of the transponder** as a 'block' and all of the eastward bound traffic coming back from west coast centers such as Phoenix, Los Angeles and San Francisco blocks within a second transponder.

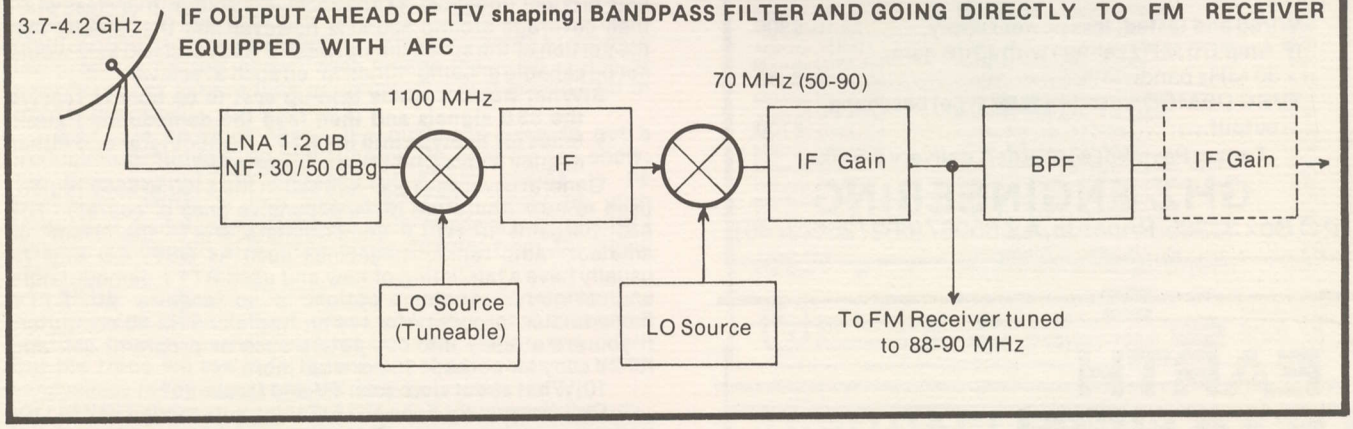
These assignments are handled by the satellite operator, they can (and are) varied from time to time as circuit (channel loading) demands change from one uplink site center to another.But - the basic on- satellite transponder configuration stays quite constant. However at any given point in time you are apt to find a mixture of FDM-fm and fm-FDMA signals within a given transponder. On the surface it sounds as if it might be very confusing.

While not all of the transponders in use for FDM-fm and fm-FDMA utilize the allocations scheme **shown here**, it is the most common format found. Basically you have a baseband (as in DC to some upper limit of your video amplifier processing stages in your receiver) output on your receiver. You have always thought of this as something that connects video to your monitor or as drive for your modulator. When you dial up a transponder that is **not** carrying video, but rather is carrying some form of voice and data, what you are really having coming out of the 'baseband' or 'video' spigot on the receiver is a miniature frequency spectrum that starts at DC and goes on up. And since the carriers occupying this 'spectrum' are typically lower sideband modulated (although there are some that are upper sideband modulated in the 12 to 60 kHz region), if you wish to demodulate these SSB signals you need to feed the baseband/video output to a suitable demodulator box. This can be any 'general coverage' (selectable) single sideband (communications) receiver.

Having connected the baseband/video output of the TVRO video receiver to the antenna-input jack on the SSB receiver you are ready to 'tune' the mini-spectrum looking for signals. What you will find (assuming you have dialed up a transponder that is not carrying video but is carrying audio/data) is a whole series of 'carriers' spaced almost precisely 4 kHz apart. Every little while you will find an odd-spaced (2 kHz separated) carrier; an LO mixing carrier. **Some** of the 4 kHz spaced carriers will be modulated; one side of a telephone circuit, half of an engineering intercom line between engineers and technicians associated with the satellite operations, perhaps an RTTY (radio teletype) channel, commercial network intercom channels, commercial radio network news feeds and a host of other 'narrow band data'. Most of this gets demodulated fully with the addition of the DC to 4 (+) MHz selectable sideband communications receiver. **RTTY channels however** are further 'modulated' and to make any sense out of them you'll have to go one further step and apply the demodulated audio from the sideband receiver to the input of a gadget called an 'RTTY Demodulator'. This box accepts the audio tones that make up the RTTY signal, translates them to either the Baudot or ASCII format as required and then drives yet the final box; a printer of some sort. With this additional equipment you can view on a CRT display or copy on a hard paper Teletype® machine the current AP or UPI newspaper or radio (they **are** different) news wire feeds, the latest cattle prices in Chicago or the latest gold prices in Zurich. It is all there, much of it 24 hours a day. In fact you can copy or read the full details of tomorrow's newspaper



BASIC LOW COST AUDIO-RECEIVE-ONLY [ARO] **TERMIAL**



stories (national and international anyhow) in the evening before you go to bed if that turns you on!

If you have been bitten by the TVRO bug and had no knowledge that all of this 'other data' was available on the bird, it may be a little confusing at this point. Let's see what some of the typical questions might be:

1)**I understand that each TV signal has with it an audio sub-carrier and that this sub-carrier may be anyplace from around 5.5 to 7.5 MHz although it is typically on 6.2** (WESTAR) **or 6.6** (COMSTAR) **or 6.8** (SATCOM) **MHz. Are you saying that all of these hundreds of other audio and data and teletype etc. carriers are also there too?**

Yes, but not on the same transponder. They operate separate from the video modulated transponders.

2)**Can I connect the baseband output of my TVRO receiver to a general coverage communications receiver and tune in the sub-carrier range by tuning 5.5 to 7.5 MHz?**

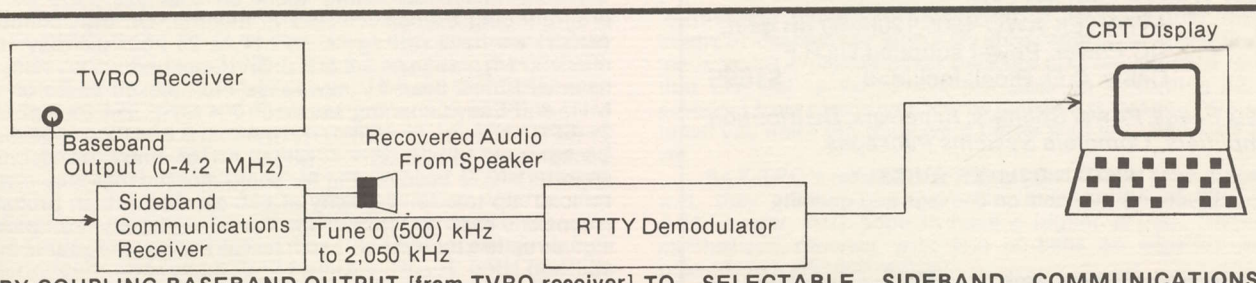
No, you cannot. These sub-carriers are FM (frequency) modulated whereas the other carriers we are discussing are actually AM single sideband (suppressed carrier).

3)**Then to tune in just the TV transponder sub-carriers I require a separate type of audio tuning system?**

Yes, and we'll be covering that in an early **CSD**. That's what all of those sub-carrier demodulator circuit boards and reports seen here in **CSD** are for.

4)**Can I use the TVRO receiver to simultaneously tune in both the audio that goes with the TV picture, as sound, plus other sub-carriers on the same transponder?**

Yes, you can. Some transponders are heavily loaded with sub-carriers. Number 21 on FI, for example, has its regular TV program audio on 6.8 MHz. On 5.8 MHz is something called The Disco Network on while the same transponder has Seeburg Background Music on 7.4 MHz. With a 'tuneable' sub-carrier detector added to your TVRO receiver you can independently



BY COUPLING BASEBAND OUTPUT [from TVRO receiver] TO SELECTABLE SIDEBAND COMMUNICATIONS RECEIVER, SSB-[FDM] AUDIO SIGNALS ARE RECOVERED.CONNECTING AUDIO OUTPUT OF COMMUNICATIONS RECEIVER TO RTTY DEMODULATOR PRODUCES NEWS/WIRE HARD [paper]OR SOFT [CRT] COPY DISPLAY.

tune in either of these (or both with two outboard sub-carrier detectors) in addition to enjoying the audio that goes with the transponder 21 video on the normal 6.8 MHz sub-carrier.

5)**Where does one find a listing of where all of these audio/data/RTTY channels are operating?**

A comprehensive list is currently being prepared by several groups and observers. The problem is compounded however by the fact that as transponder 'loading' (i.e. the total quantity of such channels in use) goes up and down the satellite operator has the ability to move whole Groups, Supergroups, and Master Groups around within a transponder or even off to another transponder. However most of the 24 hour per day services (such as the various radio network feeds and AP, UPI teletype service feeds on SATCOM FII transponder 16) are virtually static.

6)**Within the band 0 to 4+ MHz, is there some portion of it more commonly utilized than others?**

Yes, the lower 12 kHz or so of each Group or Supergroup or Master Group is dedicated to engineering intercom voice communications. That's where you will find the audio links between Vernon Valley and South Mountain (RCA's twin TT&C stations), for example. The lower Group A between 4 kHz and 60 kHz is seldom used for regular traffic. The radio network and teletype services are most commonly between the 800 kHz region and 1,600 kHz. Again, a listing is being compiled.

7)**Is this legal to tune-in?**

Good question. Section 605 certainly applies to the **private** message traffic, such as telephone calls. Whether it applies to UPI teletype feeds intended ultimately for public use or CBS Radio's Pacific coast network feed (etc.) is another matter. We make no legal judgements on this issue; merely share with you the basic engineering data to broaden your understanding of satellite communications as a whole.

8)**Is there one 'best' general coverage communications receiver for this application?**

Probably not. The new Kenwood R-1000 works very well as does a very old (20 plus year) Collins 51J4 (modified to add a SSB product detector). Many receivers sold in this class start their coverage around 500 kHz however and that means that the portion of the spectrum between 0 (DC) and 500 kHz would not be capable of being 'tuned in' on such a receiver.

9)**What would a whole lash-up cost to be able to receive the SSB signals and then feed the demodulated audio tones for teletype into the RTTY demodulator and either display it on a CRT or on a line printer?**

General coverage receivers sell in the $100 to $500 region, used to new (there are more expensive ones of course). The best bargains in RTTY demodulators are in the 'Ham' or amateur radio ranks; magazines such as **QST, CQ** and **73** usually have a fair listing of new and used RTTY demodulators and printers. Another option is to acquire an RTTY demodulator 'program' for say an Apple or TRS-80 computer. If you are already into computers such a 'program' can add RTTY copy for perhaps $50 or a tad more.

10)**What about slow-scan TV and facsimile?**

On transponder 6, on the 6.2 MHz sub-carrier, is the UPI 'Newstime' slow scan picture service plus accompanying (multiplexed) audio. This works by breaking a news wire photo down into a low data rate that takes perhaps 12-15 seconds to transmit a full video tube display. The picture 'paints across' and down the screen. this service sends tomorrow mornings newspaper photos with appropriate audio (i.e. an announcer reading a news story that goes with the photo) into your home about the same time as your local morning newspaper is 'going to bed' for the next day. The CATV firms spend upwards of $6,000 to process this 6.2 MHz sub-carrier sufficiently to feed it into a TV modulator. Hams have been doing that (using a slightly different technique) for around $500 in (new priced) gear for years. So far this has not been a very impressive service so there hasn't been much interest in doing it 'cheaply'.

11)**Since I already have a TVRO receiver, what can it cost me to be able to tune in the various sub-carrier [FM] services? And what and where are they?**

CSD has been listing them on the last page of the programming section for several months. On transponder 3 (WGN) we have Chicago's WFMT, a 24 hour per day 'fine music' (FM) station on 5.8 MHz. On transponder 6 (WTBS) we have UPI Slow Scan TV news plus multiplexed audio on 6.2 MHz and Easy Listening Music on 7.4 MHz. On transponder 21 (SPN) we have The Disco Network on 5.8 MHz and Seeburg Background Music on 7.4 MHz. All of these transponder operators have been saying for some months that they intend to 'load' up to a full capacity of sub-carriers (which **probably means** one each on 5.8, 6.2 and 7.4 plus possibly multiplexed signals up to a total of 5 on each) just as soon as the gear is avail able.

All you need is a sub-carrier detector (Rohner Machine Works and others have them available; see their ad in this issue of **CSD**) and an audio system with speaker. It could be put together for perhaps $25 to $35 if you had a decent box of parts.

SPTS '80 NEW EQUIPMENT PREVIEW!

TECHNOLOGY A-GO-GO!

Everywhere you turn at SPTS'80 in San Jose (July 4, 5 and 6) you will probably be tempted to scratch your head in wonderment. In the past pair of SPTS events we have been mindful of many suppliers working extra long hours to prepare new products for the 'show', each feeling the crush of one or more deadlines to have their equipment up and operational in time for the event.

BUT - in previous shows the push has been to get a production **prototype** 'up and running' in time for the show; this time around the message of Miami seems to be everyplace. What is that message? Don't show up with production prototypes...**show up with hardware in quantity** that can be bought and taken home directly from the show itself!

TRUE - there will be some production prototype equipment on display. That means new equipment that is not yet field proven, perhaps not yet into real world production. But the trend we see is for quantities of equipment to be on hand, ready for delivery; not just display.

MUCH of the equipment coming to San Jose will be new. It will not have been seen prior to the show except in limited private showings. Many of the suppliers at San Jose are new to the field and San Jose is a starting up point for their new equipment. Let's touch briefly on what some of the advance data suggests:

(1)**Receivers** - ICM will have a new generation version of their TV-4200 on hand. It will feature a plug-in remote control head that they say you can hardwire throughout the house to allow you to change transponders with the plug-in remote from virtually any place in the building. We told you about the twin-versions of the Tay Howard receiver last month (see May **CSD**, page T5). This group hopes to have a large quantity of receivers stacked up in their booth; and the projected $1300 price won't hurt sales any if they make it!

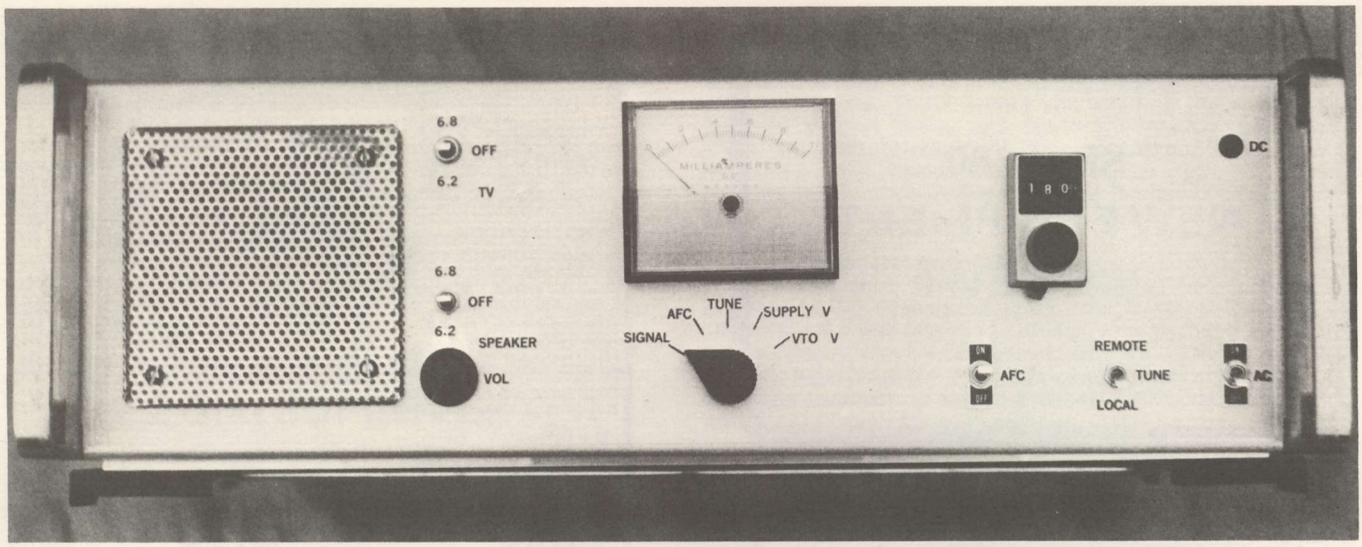
There is a new receiver coming from Rohner (7th and Elm, W. Liberty, Iowa 52776) which sounds very intriguing. The price is $1500. BUT - **that includes an LNA**. Hummm. First you have an antenna mounted LNA plus downconverter that takes you from 3.7/4.2 down to a high IF in the 400 to 900 MHz range. The LNA front-end is in the 120 degree K range, uses a pair of (NEC) GaAs-FETs and an active bi-polar mixer. Level out of this portion is +6 dBm. Inside you have the 'RCVR' (Rohner Converting Video Receiver) that further downconverts first to 190 MHz and then again down to 40 MHz. The audio sub-carrier is frequency-converted to 4.5 MHz (rather than being demodulated to baseband) while the video is demodulated and applied to an RF modulator. If that sounds like a lot of product for $1500, there is more. Words like synthesized and digital creep into the discussion. Oh yes, you will be able to use one 'Combo' box (the LNA/downconverter) at the antenna and run up to 12 separate 'RCVR' units (each to a different neighbor if you wish!) and everyone will have a full choice of any of the transponders on that particular polarization.

H&R expects to be the first to show a new package from 'commercial' supplier Microdyne; a receiver that mounts totally at the receiver with a six wire cable coming inside. This too is an LNA-plus-receiver package and we've heard reports that the 'list' price on the full package (including 12 foot antenna) from Microdyne will be in the $8,000 range. We'd like to tell you more but think we'd better wait until San Jose to do so.

SAT-TEC's new $995 receiver (see **CSD** for May, page T8) will, they promise, be available 'in quantity' at San Jose. Additionally, they hope to have a higher priced, frequency synthesized receiver with lots of bells an whistles on it; possibly in the $1800 region.

Several other exhibitors are promising new receivers; we'll see what transpires.

(2)**LNAs** - We don't expect any startling commercal revelations in this area at SPTS (if you overlook the Rohner



NORTH AMERICAN HOME VERSION - of the new Taylor Howard designed receiver as will be manufactured by Vancouver's Satellite Supplies. This unit, one of 5 assembled by Howard for the Canadian firm, could be considered a pre-production-run proto-type.

LNA**plus** receiver package). The Rohner 'Combo' package by the way could be separated (as a separate LNA) although they haven't any plans to do this right away. **We have concentrated** on getting more people who have LNA building experience on the program however as we'll visit shortly. If there is any really big LNA news at SPTS San Jose, it may be some slight price reductions in the existing commercial products.

(3)**Antennas** - The 'spherical' design and many new metal and fiberglass and foam antennas will be on hand. As reported in both April and May, Hayden McCullough's 8-Ball spherical will be on display and available for delivery. We wouldn't be too shocked to see an operating 8 foot 8-Ball and **perhaps** even an operating 6 foot 8-Ball antenna in San Jose. Also new there will be 10, 12 and 16 foot 'Eagle' Spherical section antennas from Wagner Industries (Box 559, Alva, OK 73717). Chaparral Communications now has a basic 10 and a basic 14 footer with extension panels to make them 12 and 16 feet respectively. They have a new Tay Howard designed feed similar in concept to the Birkill Hybrid Mode feed which looks like a winner; the day of the standard feed horn may be over! Satellite Television Systems of Poplar Bluff, Missouri (R #1, Box 132B, 63901) plans a newly designed fiber-foam panelized antenna, plus whole packages (including LNA and receivers) for dealers and distributors.

Through all of this is the word 'innovation'; virtually all of the new firms now entering the field are expanding upon the basic technology, not content to merely 'copy' and cheapen. That's a good, healthy sign that ingenuity is not dead in this field (we never thought it was!).

This barely touches the surface of the more than 30 exhibits already taken (we'll have at least twice as many in San Jose as Miami!); to those who didn't get their products mentioned, stick around; we'll see that everyone exhibiting gets a review in the August issue after SPTS!

AND THE PROGRAM...

The San Jose program is very innovative; which simply says that we don't feel locked into any past formats. Here are some of the highlights:

1)**Technical** - Sessions will run from 10 AM on the 4th through 9 PM with appropriate breaks for lunch and dinner. They will run on the 6th from 10 AM to 3 PM with a break for lunch. Saturday the 5th will be a really neat day;we have set aside an area and created a schedule whereby experts on LNA design, antenna design, receiver design and system's design will hold informal group sessions. You can wander in when these mini-sessions are going on, sit down close to the guy who is the expert, handle his equipment and talk with him about what it is he has done to make it work. We plan to videotape these informal sessions and then run the tapes back on the MATV system later on the 5th and early on the 6th. For all who didn't get the opportunity to fondle equipment and talk shop in Miami, this will more than even the score.

The full sessions will include (this touches but the tip of the iceberg) the following: (a)**Single Conversion Systems** - Norman Gillaspie and David Barker (see twin articles this issue of **CSD**); (b)**Antennas** - Nelson Ethier from Montreal who will discuss and explore building your own lower-cost parabolic antenna; Hayden McCullough will disucss Spherical antenna design and the feed system; (c)**Microwave Technology** - Steve Chambers of Rohner will describe stripline design techniques while H. Paul Shuch will outline the problems and pitfalls of active mixer design at 4 GHz; (d)**Receivers** - John Ramsey will describe how you build a commercial TVRO receiver for less than $1,000. Taylor Howard will counter with his own thoughts on lower cost receivers. (e)**LNAs** plus front end design - John Rohner will describe the 1984 Receiver while Bob Luly will tell you how to build 4 GHz GaAs-FET amplifiers.

There will of course be much more. Steve Gibson will tell you all you ever wanted to know about 'satellite navigation'; how to design a series of antenna mounts that can even be motor driven and controlled precisely by a TRS-80 computer program. Coop will conduct a session on audio and data reception services on the birds including a look at lower-than-TVRO system packages for ARO (audio recieve only) purposes. We'll have displays of direct satellie reception of audio, RTTY and other narrow band services.

The Hyatt in-house MATV system will 'transmit' on a pair of channels no less than 40 hours of all-about-satellitess programming information including both special videotapes prepared in the field as well as videptape coverage of the seminar sessions themselves. As we have previously announced, if you register early enough to get into the Hyatt, you can bring along one or more VCR units and tape away to your heart's content. (We suggested last month that you had better bring around 50 'blank hours' of video tape with you!). Each morning (4th, 5th and 6th) you will awaken to a special on-MATV-system "**SPTS '80 Good Morning Show**"; a look at the technology to be described in sessions that day on the SPTS '80 program as well as some highlights of the previous day. This will be quite a video event!

STATUS REPORT - ROOMS

As of mid-May (our deadline for this issue of **CSD**) around 50% of the Hyatt rooms have been taken. The Hyatt has agreed to hold **without deposit** any rooms requested **prior to** June 13th;

after that date, if they have any rooms left, to be guaranteed a room you'll have to submit a deposit with your room request.

When you pre-register with us for SPTS '80 you receive back by return mail a four page detailed-instructions confirmation letter. Also included will be a Hyatt Hotel registration card. You will fill in that card and **promptly** return it to the Hyatt where your room assignment will be made.

NEW MANUALS

A **minimum** of three new manuals from STT will be available for the first time at SPTS. Included will be:

1) **NELSON TVRO PARABOLIC ANTENNA MANUAL** - all you ever wanted to know about designing and building your own lower-cost TVRO antenna, mount and feed system. PLUS - a unique concept in 'sharing of the mold-form' for this antenna so that many people can build off of a single sub-structure.

2) **GIBSON TVRO NAVIGATION MANUAL** - The complete world of mounts from super-simple (using a child's play swing structure or borrowing the backyard clothesline support!) to the super sophisticated (a computer driven fully automatic terminal that will switch birds for you on command!). PLUS - an easy to understand set of complete instructions on aligning your dish to the satellites using the sun (a Sun Compass is included) and an inclinometer (also included in the manual!).

3) **Coop's SATELLITE USER'S MANUAL** - How to find, demodulate, de-cipher and enjoy all of the various wideband and narrowband (SCPC, data, RTTY, network radio links, etc.) transmissions on satellite. Virtually every radio network in America and Canada is now on a bird; you can tune-in the latest Anchorage Flight weather or NPR or even a set of Anchorage AM radio stations if you know where and how to look. Tune-in TV network "Producer's Circuits" where network instructions are being sent to remote crews; the latest AP or UPI news wire services and much more!

Each registrant at SPTS will have a choice of selecting **any two** of the then-current STT manuals as part of his SPTS '80 San Jose registration fee; that's part of the package you receive!

NOTE: The July **CSD** will go into the mails so that most people will be able to receive their first-class mail copy **just before leaving** for San Jose. Because of the size of the group sample copies of **CSD** will **not** be given out in San Jose although a limited number of July editions will be on hand.

See you and your friends in San Jose!

STEVE GIBSON, the clever 'Satellite Navigator', will explain how you construct your antenna system so you can change birds with the greatest ease and accuracy.

TECHNICAL NEWS NOTES

FCC PERPLEXED over how to handle sudden influx of requests for Clarke orbit spots. Presently there are 14 3.7-4.2 GHz satellites requesting spots, a total of six requesting spots for both 3.7-4.2 **and** 11.7-12.2 GHz (dual band) birds, and, six more requesting 11.7-12.2 GHz only downlink spots. First argument is how many spots there are; some believe 13, others 17. Those who feel 17 may be available suggest expanding orbit belt on east (such locations would not cover Alaska or Hawaii) and squeezing exiting locations down to 3.5 or even 3 degree spacing. Obviously FCC will have to select those who will get spots; process will start this fall.

WESTAR wants to offer a higher power SCPC service (22 dBw which for relatively narrow bandwidths is equivalent to +48 to +52 dBw video EIRPs) for Muzak and others who wish to directly feed small (4-10 foot) dishes. RCA has complained, says these high power levels may degrade 'delicate' lower power SCPC channels on adjacent satellites.

ATT asking FCC to allow it to launch three new satellites to replace existing three; at cost of $230 million. Firm wants to retain orbit spots at 87, 95 and 128 west.

CONFEREES at 8th annual Communications Satellite Conference in Orlando came to 'conclusion' direct-satellite TV

is 'already here' in North America. Group had misconception such terminals were only practical utilizing 'relatively expensive CATV hardware' and suggested that **if** future satellites will have ANIK-B power (10 watts) in C band (3.7-4.2 GHz) whole terminals for $1,000 may become practical. New SATCOM FIII bird in fall of 1981 **will have** 8.5 watts on at least six transponders so even in opinion of this august group, we are getting close!

DETAILS on WESTAR (FCC) approved high power SCPC service; service will probably be on WESTAR III, transponder 1. Will allow up to 20 SCPC signals into transponder (maximum loading) at 22 dBw EIRP each. Signals will be SCPC 15 kHz wide and main application will be UPI and AP newswire services, radio network feeds designed to be received with dishes in 4 to 6 foot class. Basis for system is that you are trading power for bandwidth; single transponder can normally handle up to 1,200 SCPC channels, with available EIRP split amongst all of them (see special report this issue).

NATIONAL Academy of Sciences sponsored symposium on direct broadcast satellite TV saw speculation that first US generation of 11.7-12.2 GHz DBS birds will offer between 5 and 10 channel (transponder) capability at 20 to 60 watts per channel (present ANIK-B is 20 watts); next generation would have 3-13 channels with powers as high as 500 watts per channel. At 500 watts per channel dish size at 12 GHz would be around 12 inches (!). The time frame on all of this would be 1990'ish.

ANNUAL broadcaster show had smattering of satellite announcements; plenty of high price tag hardware for broadcasters getting their own receive terminals. Most significant announcement was RCA plan to provide 'digital audio' service wherein users could select between two or more simultaneous audio channels fed to stations.

IN THE JULY CSD...

A number of exciting events were taking place as this issue went to press. On May 11th Coop and local enthusiast Tom Gardiner began assembly of an ADM 11 foot antenna to be used for an attempt at bringing in the 'over-the-north-pole' MOLNIYA (Russian) inclined orbit bird. On May 18th the antenna was completed, a 180 K LNA and .4 f/D feed installed and tests were run on the domestic satellite belt. Also on the 18th a pre-production SAT-TEC 24 channel tuneable receiver arrived (this is the $995 wired and tested receiver detailed in the May **CSD**).

At 3:25 PM local time on May 18th after five hours of careful sky searching **MOLNIYA was found on 3875 MHz.** The bird first seen was in a descending node (i.e. leaving apogee) at an elevation of 65 degrees and an azimuth of 22 degrees. The bird was tracked for 65 minutes before the Russians turned it off (switching TV transmissions to the next bird in the chain).

Success from the Russian inclined-orbit bird(s) with a linear feed and a 11 foot antenna plus the new SAT-TEC $995 receiver and a (purposeful) 180 degree K LNA convinces us that reasonably good quality 'Moscow Olympics' reception via MOLNIYA will be possible this summer. A full report in July.

COOP'S COMMENT ON PROGRAMMING

BEING OUR NEIGHBOR - PART TWO

In our Technology Section leadoff this month we discuss the plight of the Canadian private terminal operator who has purchased a US built LNA and then has the unfortunate problem of attempting to get it repaired. The bottom line was simply that being our (US) neighbor can be very perplexing at times.

In the opposite geographic direction from Canada our more southern neighbors are having their problems with our technology as well. Many countries such as Mexico, the Bahamas, the Dominican Republic et al simply don't get all hot and bothered because **a few** residents of their country are 'foolish' enough to want to invest up to 20,000 US dollars to create American TV in their haciendas. The few who can afford such a luxury are not causing anyone else around them any problems with their American TV and since those who can afford are often those with political power or politically powerful friends and business associates, the impact of this technology is simply ignored.

Potentially this may change in the coming year or two simply because those who are dabbling in US space technology by having private terminals are beginning to feel the same motivating forces that caused Canadian pioneer Rod Wheeler to share his private terminal back in 1977. And when the service moves out of the private living room into the public section (either via cable or via the airwaves) the impact begins to spread appreciably. Actually, it is already happening.

In San Jose, Costa Rica there is a new UHF television station on the air. It operates on channel 17 and it operates in a scrambled mode. It has a license from the Costa Rican government and it collects $30 (US) per month from any home that wants the unscrambled service. So far this is Costa Rica's business and nobody elses. But alas the programming for San Jose's channel 17 comes from the United States. It gets to Costa Rica on videotape at the moment but that may change soon and of greater interest perhaps is that when it is taped **for** Costa Rican play **here in** the states it is taken from multiple sources **including** satellite feeds. NOW - that suddenly becomes the business of some US interests since in effect the US copyrighted material is being 'pirated' (yes, that is a nasty word!) offshore for someone's profit.

Nor is this an isolated example. Recently the Republic of Panama granted a license to a chap to build a channel 14 UHF station. This station will be operated in a scrambled mode, a fee will be charged for descramblers-subscription and the programming will come from the US. **How** is not clear at the moment, but one must at least suspect that like the San Jose station it will somehow involve satellite transmission. Oh yes, whereas in San Jose the English language programming on channel 17 largely appeals to that small percentage of the 'upper' class that speaks English fluently, the Panama installation is by design intended to cover a **small** portion of Panama but virtually **all** of a major US base there. The subscribers will, of course, be Americans living in Panama.

Then there is the persistent rumor (and we label it as such) about the proposed super-gigantic cable television system being designed to serve a 'small' section of Bogota, Columbia. According to several different reports from enough different parties that we believe there is at least a shred of truth in it all, an 11 meter receive terminal pointed at FI will collect four US programming services, and then funnel them into a modern CATV system that will pass an estimated 600,000 people (!). The literature prepared lists HBO, SHOWTIME, WTBS and SIN as the programming to be available...at (are you ready for this!)...$75 per month. Will this operation (if real) be a 'legal' user of these signals? Since none of the listed services (nor FI) are apparently authorized to accept 'customers' outside fo the United States, it is doubtful. Bogota then could become the largest pirate operation in the world.

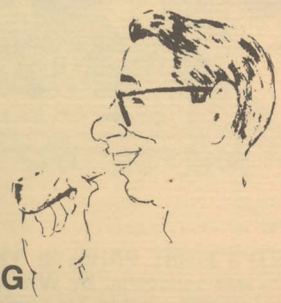
This 'pirate' label is a dangerous one. As the operator of San Jose system found out, after spending months **trying** to negotiate legal rights to the programs, between US laws and private contracts created by programmers there is simply no mechanism available for legal use of US services. Perhaps it made no difference when we were 'isolated' by the limited reach of our terrestrial services. But the satellite service has changed all of that and as a nation dedicated to new technology we should also be just as dedicated to reframing our laws and our regulations **and our contracts** to keep them abreast of the changes in technology.

No, in our humble opinion these operators to our south are **not** 'pirates'. They are frustrated business people, agog at our technology, anxious to share it with their own country, but frustrated by our unwillingness to recognize that they even exist. You cannot set a pushcart in Harlem loaded down with $100 bills and then expect the local residents to ignore its presence.

We are the problem. We send out our boxes and our messages and we overwash all of those within our reach. Our satellites have extended our reach and now that we have an 'electronic media' presence in the neighboring countries, we need to accept the legal responsibility and the moral responsibility that allows these $100 bills to be picked up and used.

Failing to do that, I believe we cannot long maintain that our media cannot be received and re-used as these neighboring countries see fit. Clearly the time has come for our legal framework to catch up with our technology.

CSD PROGRAMMING



COOP'S SATELLITE DIGEST (Programming Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P. O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is $50 (US funds) in advance Canada, US, Mexico; $75 (US funds) elsewhere.

PRIVATE TERMINAL RECEIVERS A HISTORY

WHEELER IN THE TUNDRA - The first Canadian to have a private terminal, way back in the summer of 1977, Rod Wheeler with his homebrew 15 footer outside his cabin-home in the wilds of the Yukon. He had to 'drag' the dish home more than 15 miles from Whitehorse on a sled over very primitive roads.

NOW TWO YEARS OLD...

It was just two years ago this month that the first designed-for-private terminal receiver was born. Perhaps you never heard about it and you'd like to know where all of this began!

First of all, there was a chap living in the Canadian Yukon by the name of **Rod Wheeler**. Rod was your typical far-northern Canadian with some well voiced disdain for the way those who lived in the far north of Canada had to get along with their remoteness, high prices for everything, and last week's newspaper. Television reception was little better than the tapes flown in from southern Canada and broadcast over a local CBC transmitter. For many of the residents of the Yukon even CBC tapes didn't work simply because no CBC transmitter was available in the area.

So Rod had set out, in the summer of 1977, to do something about it. He and a few cohorts decided that they would install a private satellite terminal. Rod was associated with a cable company bringing in programming via tape to the community of Whitehorse and he decided that if he could round up a TVRO receiver and an LNA he would have a go at building his own 15 foot dish. By the end of June he had it all put together and on a Friday preceding a three day Canadian holiday they turned it on and the residents of Whitehorse were treated to three full days of live television via satellite from such places as Atlanta, Georgia. The reaction of the local population was immediate; **they loved it**. The reaction of the Canadian government authorities was just as immediate. It was illegal.

And so early on the first day of regular business following the holiday Wheeler had a visit from a Canadian communications official. **"Turn it off and dismantle it...NOW"** he was told. Wheeler knew going in that there was no precedent for their activity; that at best the Canadian regulations prohibited such funny business. But he had counted on public sentiment, after three days of high quality satellite television, to carry him through the battle with the authorities he fully expected to come.

Public sentiment came alright; thousands of letters, telephone calls and other statements of opinion were dumped upon the authorities; who didn't bend under the weight. And so the terminal was dismantled and the large homebrew antenna was placed on a drag sled and hauled off into the tundra some miles out of town where Wheeler had his cabin-like home. Following a suggestion he applied for an 'experimental license' from the Canadian government and was actually granted one (much to his surprise) with the unlikely 'call letters' of VE9EDX. And so Wheeler had satellie television at his remote cabin while the rest of the Yukon residents returned to re-runs and old taped programs.

Wheeler's fame spread, first by word of mouth, then by newspaper articles, and eventually via the CBC itself. A plan began to evolve in Wheeler's mind. He decided he went wrong by springing satellite television into a community where local CBC service (fed by satellite/ANIK II and tape) already existed and by doing so he was directly challenging the government. His next installation he decided would go into a community where there was no television. Period.

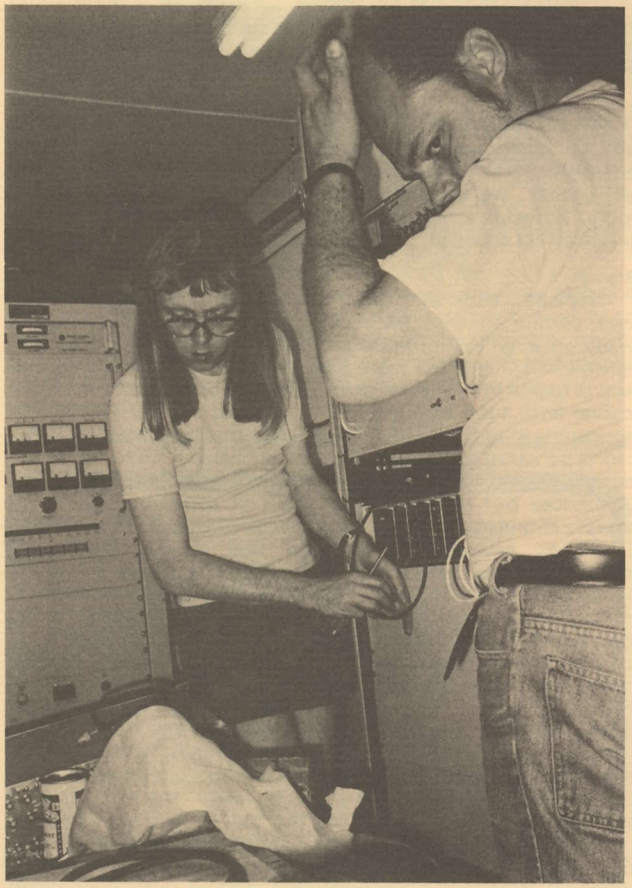
By late in the spring of 1978 Wheeler activities had become so well known that Coop was beginning to hear about Rod. After a few telephone conversations between the two Wheeler agreed to travel to Oklahoma in July of 1978 to take part in a cable television conference being put together by Coop which they hoped to transmit live, via satellite, to hundreds of cable systems nationwide. Wheeler came down to the conference early and met with a talented young hardware designer named Steve Richey. Now Richey was one of those engineers with microwave sensitive fingers. Steve could shove his thumb into a 4 GHz mixer and tell by the way the scope display and picture changed where to cut, where to add and how much to do of both. Between Wheeler and Richey the very first private satellite receiver was born. They called it the PT (for private terminal) 1024 and it carried on the front panel Wheeler's firm's name; **Northern Satellite Systems.**

This receiver had lots of eager helpers working on it

WORLD'S FIRST PRIVATE TERMINAL RECEIVER - this PT1024 was conceived by Wheeler and Richey and it started such a furor at a cable TV trade show Richey had to hide it under a table cloth!

although Richey ultimately was responsible for its performance. Now it turned out that in addition in Wheeler, Coop had invited world-known English TVRO experimenter Steve Birkill to Oklahoma for the same conference and Birkill spent a couple of days hanging around Richey's shop trying to decide if Richey was for real or not. There were probably never two more opposite engineers at work. Birkill's fingers are talented but this Steve likes to dope everything out on paper in advance. Richey's mental processes are different; he grabs a handful of parts and a piece of G-10 and starts sticking parts down. Richey seldom commits anything to a written schematic and more often than not no two of his products ever look alike, even if they are supposed to be the same product!

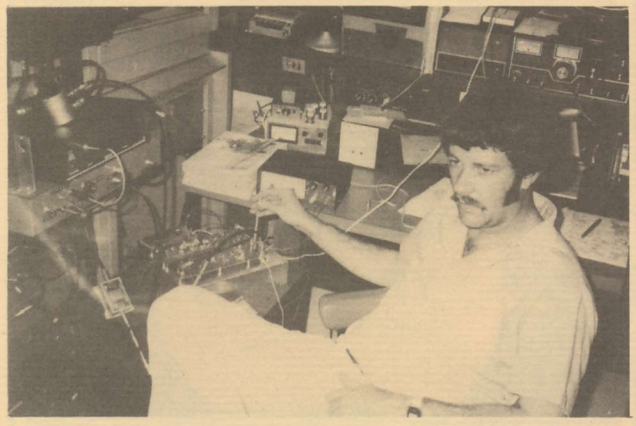
The Northern Satellite Sysems receiver had a bunch of



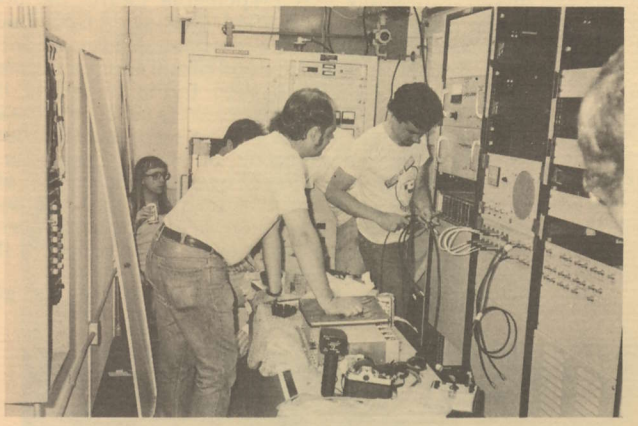
BIRKILL ADJUSTS THE UPLINK - Steve Birkill [left] put his BBC-trained super talented hands to work making a three-year-retired 3 kW 6 GHz uplink transmitter work so that hundreds of cable systems nationwide could 'attend' Coop's CCOS conference in July of 1978.

Richey, a fair amount of Wheeler (who is no slouch as a designer) and just a tad of Birkill in it when it finally left the Richey shop and headed for the cable TV trade show. Its mere appearance there started a furor.

The whole concept that somebody (anybody!) would actually sit down and design a TVRO receiver for PRIVATE use was more than the cable operators wanted to hear about. Richey finally had to remove it from his display table and stick it under a sheet to keep the angry show goers from popping off about it. The TVRO receiver suppliers with 'traditional' receivers were no more pleased. Here was a receiver priced in the $2500 region that tuned in all 24 transponders, had selectable 6.2 or 6.8 audio sub-carriers, metering of the signal (with AFC on and off), operating voltage metering and a built-in LNA power supply jack. The closest commercial



RICHEY'S 4 GHz FINGERS - tweek away on a demod board while he trains his eyes on a monitor as one of dozens of boards he built and tried gets the real world test before the first PT1024 receiver was built and handed to Wheeler.



WHEELER AT WORK - The Yukon's Rod Wheeler, [right] in front of rack, puts the finishing touches on the uplink transmitter; that's Steve Birkill nurturing a US beer in the back [left] corner, working on the cabling for the uplink power supply. Wheeler's wife sat at home in the Yukon and watched her hubby via satellite!

receiver at that time was priced around $5,500. Clearly $2500 was a stab in the pocketbook.

Worst of all here was a receiver that actually suggested that it would be used in a **private** residence. Why even the front panel was labeled 'WESTAR', 'ANIK' and 'SATCOM'! Richey, who was never well understood in the CATV world anyhow, spent most of the show hiding away behind pillars. Wheeler smiled a lot (he had anticipated the reaction and since he was going to sell them **only in Canada** anyhow didn't care what the US cable operators thought). Birkill pretended he never heard of Richey; but not because he didn't like the concept. He just didn't get along well with the wild-eyed and usually unpredictable 'other Steve'.

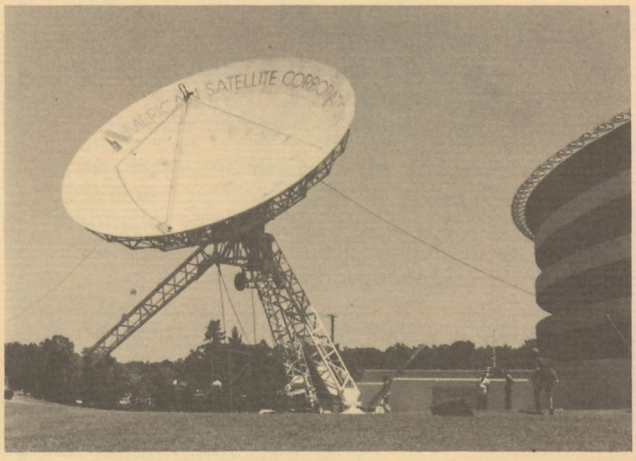
Perhaps six receivers like the one shown here were actually built. No two were alike, and any one of the six is a collector's item these days. Richey was under contract to build another 20 or so for Wheeler and then Wheeler was planning to shift the final part of the assembly operation to Canada where more favorable tariffs prevailed. Alas Richey quickly learned what today's neophyte manufacturers are learning all over again. The LO source in the Richey receiver was a Frequency West device; an expensive at the time box that came all sealed up with no user adjustments. The price plus the indefinite (like never!) delivery schedule bothered Richey so he set out to do it his way.

His way was to work around long lead times on parts that never came. At that particular moment VARI-L DBM500 mixers were not that difficult to get (the big interest had not yet begun) but LO sources were totally impossible. So Richey set down to tackle the problem in two ways; first he would design a receiver with a low cost MRF901 type descrete LO source (his discussions with England's Steve had convinced him he didn't need to be using $500 Frequency West boxes). Then he would design a receiver which required only one of the hard to get LO devices but which was capable of providing up to **12 separate channels** of demodulated video and audio **at one time.**

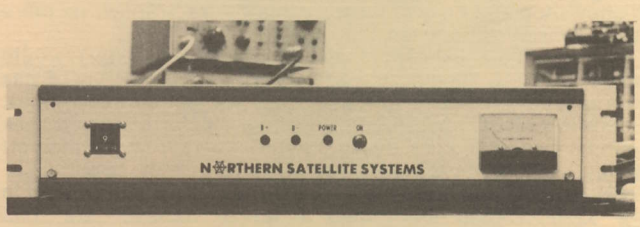
Richey created the concept that if you built one high-quality down converter (taking all signals from 3.7 to 4.2 GHz down to 500-1,000 MHz) you could then build up a chain of separate second conversion down converters to independently select anyone of 12 different signals. Downconvert once from the GHz range; down convert a second time using less hard to find parts as many times as the headend needed it done.

Richey called this concept the 'Master' and 'Slave' system. Wheeler was beginning to call Richey other things since Richey's inability to delivery was causing the Canadian more than a few problems what with winter coming on and all. Wheeler had planned to install no fewer than 15 private terminals before winter set into the Yukon. He had lined up antennas (he would build his own at first) and had ordered a slug of LNAs to back up this plan. Richey however, because of Frequency West and other problems, was up to his eyeballs in redesigning.

At least one of the new packages with 24 tuneable channels (actually 12 on each polarization) **was built**; a slim-line design which Wheeler felt looked more like an expensive piece of electronics than the original handle-carried test-equipment enclosure package. And then winter hit the Yukon and Richey got snapped up (as in swallowed) by a Texas company that wanted him and his small firm to tool up for



THE MONSTER THEY CREATED - believe it or not this 11 meter [nearly 37 foot!] antenna was assembled by hand with no equipment, hoisted into the air and made operational by around two dozen volunteers that included Wheeler and Birkill. Around 15 hours of technical sessions were sent via RCA SATCOM to hundreds of cable systems nationwide.



LAST VERSION - perhaps only-one every completed, this thumb-wheel dialed receiver was Richey's last effort on behalf of Wheeler before Steve R. bailed out of the program.

radios in the high dollar CATV market where radios were commanding big bucks and the delivery lines were long.

What happened to these pioneers? Well, Richey today is tending to a family owned and operated mini-CATV system complex in eastern Oklahoma. His talented microwave thumb is silenced for now, tending to repair of his traditional line amplifiers and other pieces of not so exotic stuff. Birkill was never really a part of the first shot at home terminals although it was while he was in the states that some of us saw our first real-live working PLL demod for video. While spending a day at Richey's shop Steve B. had rounded up the parts to build up his basic bandwidth - limited PLL unit. He, Richey, Wheeler and Coop were present at Coop's when Birkill jumpered out of the 70 MHz IF of a Microdyne commercial receiver and into his PLL board one evening late in June of 1978. "**Look at that...there's a picture**" exclaimed Wheeler. Richey and Birkill were hardly talking by this point so Richey just opened his eyes 6 extra dB in dis-belief. Coop ran around looking for a camera while Birkill played with the adjustments on the PLL chip.

Wheeler. Rod is now a resident of British Columbia and he continues in the TVRO business under the name NORSAT Systems. He's still designing receivers, building antennas, and poking pins into the 'establishment' in Canada. In fact if you are planning to be in San Jose you'll have the opportunity to see Rod Wheeler perhaps twice. A videotape made back in 1978 when Wheeler was in Oklahoma during the fabled period just recounted will run through the SPTS '80 MATV system; and, Wheeler will be on hand himself with his NORSAT Systems firm and products as an exhibitor. If you want to talk with a **real pioneer** who has faced down the mounties as they searched his warehouse looking for a 'hidden' 15 foot satellite antenna (they wanted to confiscate it!), look him up!

CLARK MIHELKO ONE MAN'S VICTORY

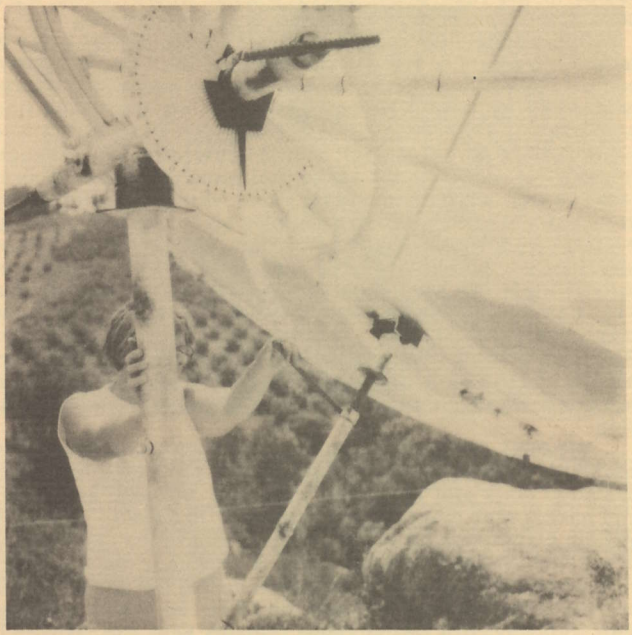
WHERE THERE IS A WILL...

Clark Mihelko of Fallbrook, California (754 Rainbow Creat Road; 92028) would possibly be considered by many to be 'dis-abled'. Suffering from Vertigo, officially disabled by the whirling and dizziness associated with the ailment, he has been forced to adapt his life style to his condition.

Mihelko is building a satellite terminal. He's doing it with his own two hands, the occasional physical strength of a few local 'braceros' and the support of his wife. He should serve as an inspiration to everyone who thinks that starting with a zero knowledge base concerning satellite reception, not a surplus of funds, and a physical disability puts you out of the running.

Mihelko, in spite of his ailment and 55 years, perhaps has the kind of background which suits him to the project. First radio and telephone service and a stint with the Ohio Bell folks doing inside and outside repair work. Next to the profession of tool and die making, followed by a period as an audio recording engineer which brought him close to his first love, jazz.

12 FOOT OF SURFACE - weight under 300 pounds, accuracy to 1/8th inch and total cost of antenna, mount, feed around $350.

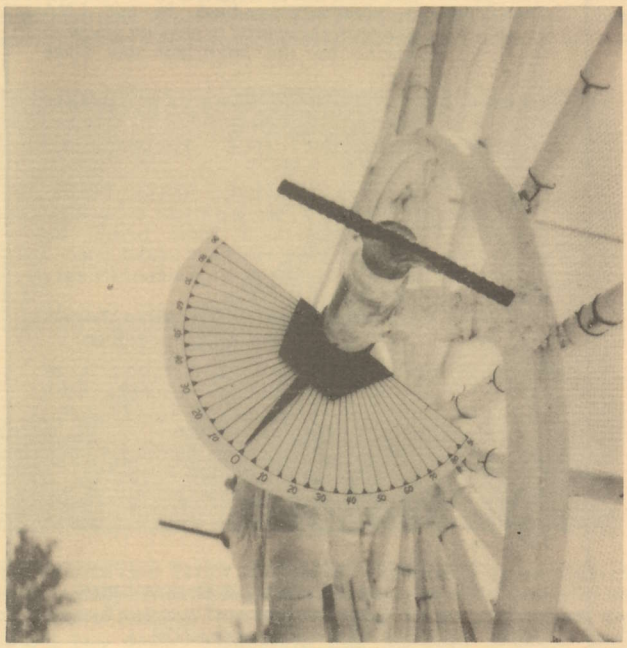


HAND OPERATED elevation adjustment being performed by Mihelko's wife.

Last August Mihelko discovered the world of satellites. Starting with the same manual set this whole private industry has grown up on he decided to work out his own design for a 12 foot parabolic antenna, a mounting system and a pair of feeds; the popular Tay Howard horn and the Birkill dual-mode or hybrid feed. Which brought him squarely against the first major hurdle; finding none of the materials he needed in sufficient quantity he located a firm in San Diego that did developmental work in tubing, sheet metal and the like. Additionally, this shop had the only 1 inch roll forming dies in extreme southern California and Mihelko decided this was exactly what he needed to get his struts rolled as he desired.

For $285 he got 1 inch black iron pipe and had it roll formed to a 6 foot radius for the 12 foot dish and an additional 21 pieces of 1 inch black iron pipe roll formed and cut to length for his radius supports. And it all fit together to a tolerance of 1/8th inch.

After hauling the materials home (by allowing the pieces to stick out the rear window and protruding into the car trunk after the back seat was removed) he next scribed upon the garage floor a 'perfect' 12 foot circle with a 6 foot radius. He followed this by scribing a 12 foot radius circle for the parabolic



ELEVATION ANGLE indicator on Mihelko's 12 foot dish.

MIHELKO'S 12 FOOTER here equipped with feed based upon Birkill hybrid mode design [see CSD February 1980].

surface, and to check on the roll formed spokes as the support structure went together.

He welded the 12 foot round circle and with a carbide grinding disc attached to a high speed drill he notched 16 spokes at the perimeter to the dish to exactly a 1 inch diameter so that it would be flush to the outer edge of the antenna.

The antenna surfacing selected was 1/8th-inch-opening galvanized screen procured at the local lumber yard. By starting with a 4 foot wide roll, 40 feet long, he cut the screen in wedge shaped pieces to fit the 'spokes' and to minimize the surface discontinuities. The surfacing is secured to the spokes with a 50 cent roll of 18 gauge copper wire; 'tied down' as it were rather than going through the laborious and perhaps counter-productive process of hard-fastening each wedge to the spokes.

Next he designed and built a polar mount which he describes as simple and functional; proudly noting that it is so balanced that his wife is able to move the dish from satellite boresight to satellite boresight with ease. The polar mount **post** consists of three pieces of pipe (1/4 inch thick wall) all fitting inside one-another (1/32nd inch clearance); this makes a total polar mount support pipe that is 4.5 inches 'thick' with a virtual 3/4 inch wall thickness. This is imbedded into a 3 foot deep concrete pier 1 foot in diameter and then the ground area under the antenna is covered with a 6 inch slab. The slab has been painted white and a transit was used to spot the true north heading and then a compass was used to mark off the white-paint-covered slab in compass degrees with the Pole Star as a reference.

The antenna weighs a total of 265 pounds. A special 3 foot ring of 1 inch pipe is welded to the exact center of the antenna. An adapter constructed from 4 inch pipe is welded and then slid in and pinned at the axis. The antenna has a double 5 inch roller bearing and rotating for azimuth is very simple and painless.

Mihelko has done this essentially alone, getting around with a cane 50% or so of the time, taking it a piece at a time and making sure the system is as foolproof and easy to work on as possible. We think he is living proof that you don't have to be an electronics engineer nor have thousands of dollars to invest or even be able to get around fully unencumbered to be a part of this satellite revolution. Mihelko will be in attendance at SPTS '80 in San Jose; look him up there or if you think he can help you out with your own TVRO antenna project, drop him a line in Fallbrook at the address given in the front of this report.

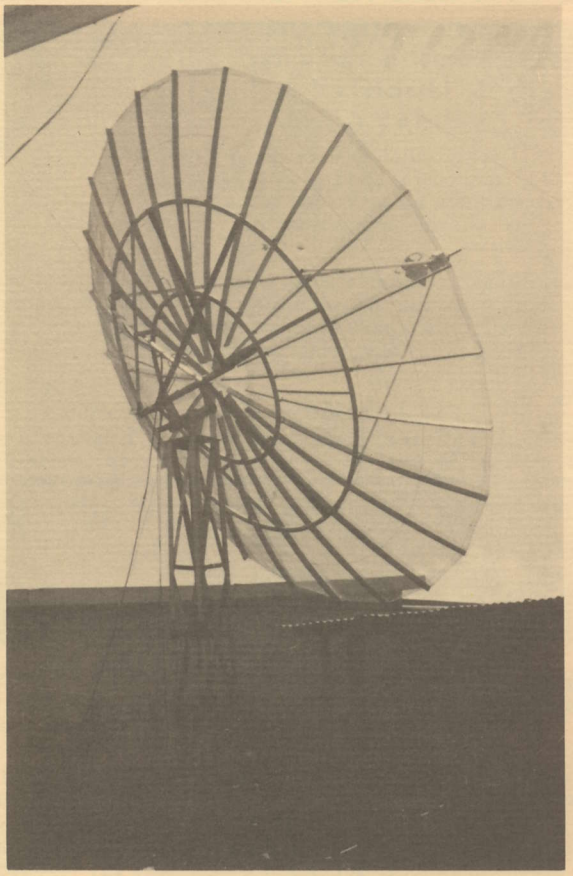
REPORT FROM COSTA RICA

The Erick Roy installation in San Jose, Costa Rica continues to get a good workout and since Roy is one of the earliest pioneers to 'feed back' data on how well it is working we felt other readers in Central America and northern South America would be interested in his results to date.

Roy is currently utilizing an ICM receiver with a standard (25 MHz) IF and a DEXCEL 120 degree K LNA (33 dB gain). His dish is a homebrew 5 meter (see photo) which can be adjusted in azimuth and elevation to track through the satellite orbit with a prop-pitch motor drive.

Roy has looked closely for signs of WESTAR III, COMSTAR D2 and COMSTAR D3 to date and his best results have been with D3 at 87 degrees west. No concentrated effort has been spent looking for SATCOM I or II or the WESTAR I and II birds to date.

COMSTAR D3 has the best signal into Costa Rica although not all of the 'fat' signals are on that bird's Caribbean beam boresight interestingly enough (the San Juan boresight channels are 4,8,12,16,20 and 24). Most of the video feeds seen to date have been on transponder 4 although video has also been observed on transponder 23. Audio and data channels, apparently going to San Juan, are on fulltime on transponder



COSTA RICA HOMEBREW antenna of pioneer Erick Roy.

20. Video testing has also been observed on transponder 24, again a Caribbean beam transponder. For the Caribbean beam channels Roy should be between 30 and 31 dBw in ground level signal. His pictures to date on the video seen has been 'way above sparklies' on the transponder 4, 23 and 24 signals suggesting that either the footprint is hotter than the EIRP maps would lead you to believe or his system is operating awfully well. Weekend video feeds, in both English and Spanish, apparently headed for Puerto Rico, are commonplace on 4 with Sunday morning a favorite feed-time.

The biggest mystery to date involving COMSTAR D3 has been the appearance of high quality video (a network baseball game feed in English from the scene of the event apparently back to network central) on transponder 23. Now this transponder is supposed to be on the switchable Alaskan/CONUS boresight antenna and since D3 is not capable of seeing Alaska entirely anyhow one has to assume that the beam is operated in a CONUS configuration most if not all of the time. In this event the predicted EIRP in Costa Rica would at best be in the high teens; not the apparent 30+ level Erick has noticed. There is no logical **textbook explanation** for the strong transponder 23 video signal observed and other transponders in that set (3,7,11,15,19) which are known to be carrying data a good portion of the time according to states side observers have not been seen. Roy suggests that because this is a boresight switchable transponder that there may be a hidden 'glitch' or antenna sidelobe in the pattern which was not detected (or was overlooked) when the bird was on the antenna test range on the ground. When a baseball game network feed was logged on this transponder another observer in central Florida was also watching and the signal was many dB hotter in Costa Rica than in Florida; evidence that Roy's 'antenna glitch' theory may indeed be valid.

This of course raises the question of what other high-level sidelobe glitches might be present, on either D3 or other COMSTAR series birds since all employ the boresight switching technique detailed in the April **CSD.**

A very low level signal (perhaps 1 dB C to N) from WESTAR III at 91 degrees has also been noted but Roy adds "**while peaking the antenna on it one day the signal suddenly jumped up in level so that a color set of video could be seen just for a few seconds, and then it went back down again just as abruptly as it appeared**". This was probably due to Roy's observing while the bird was being re-positioned by thruster rockets within its 'space box' and the bird momentarily 'rocked' bringing the boresight enough further south that his signal level was enhanced.

Roy's present project is to build a larger (21 foot) parabolic, to reduce the IF bandwidth on the ICM receiver to the 15 MHz region and to cool his LNA hoping to get it down far enough it will function like an 80 degree K unit. We all wish him luck!

MORE ON ANIK-B 12 GHz SERVICE

Recent reports from Canada suggest that TeleSat (operator of the ANIK-B service) is seriously considering cutting off the present 12 GHz 'experimental video service' as early as this coming September. The 12 Ghz program has been funded primarily to test the usefulness of the service in **direct-to-home satellite operation** and TeleSat has procured from Canadian suppliers approximately 100 terminals in the 4 to 6 foot size range and scattered them throughout portions of Canada. As reported in **CSD** in recent months, the present service is Vancouver stations CBUT (CBC affiliate) and CHAN (CTV affiliate) which share a 72 MHz transponder in a 36 MHz-each split transponder format.

TWIN 12 FOOTERS uplinking CBUT and CHAN to ANIK-B at Burnaby, B.C.

Just to put everything associated with 12 GHz into size perspective appearing here is a photo of a pair of 12 foot (!) uplink terminals located aside a pair of twin TeleSat trailer vans in Burnaby, B.C. These terminals uplink the two signals independent of one another to ANIK-B; the CBUT feed is fed via terrrestrial microwave from downtown Vancouver. One Canadian observer reports that while TeleSat may indeed decide to terminate the CBUT/CHAN 'experimental' feeds this coming September or soon thereafter, a new 12 foot uplink antenna is being assembled and installed in downtown Vancouver at the CBC/CBUT site. The **rumor** is that this terminal will at least continue to feed CBUT via ANIK-B's 12 GHz circuit even if TeleSat does close down the present uplink site in Burnaby.

Satellite Supplies, the Canadian firm that is in the process of putting a domestic version of the Taylor Howard 24 channel tuneable receiver into production (see CSD for May 1980, page T5) would like overly anxious dealers and distributors to 'cool it' until the firm is ready to show the

product at San Jose SPTS '80. The announcement in the May Digest created a considerable influx of inquiries and the most unfortunate part was a mix-up of the telephone number which was listed in the report. Seems the number given was incorrect and the poor people who have that number in Vancouver had to ask the telephone company to change it because they had received nearly 100 calls! If you feel you **must** have early information, contact Russell Walsh at Satellite Supplies, P. O. Box 278, Aldergrove, B.C. VOX 1A0. Don't attempt to call at this stage; just wait until San Jose to talk with them personally!

THE PROGRAM WINDOW RELEASE GAME

HOW MUCH A HEAD?

The latest announcement of a would-be satellite television pay-movie programmer has stirred up a hornet's nest. The (J. Paul) Getty Oil (Company) and four of the major Hollywood movie producers/distributors will form a new 'pay television network'. The movie producers involved are 20th Century-Fox, Paramount, Columbia and the giant of them all, MCA. According to preliminary reports Getty Oil is willing to bank roll the new venture to the tune of $30,000,000 and those are a lot of zeros.

On the surface, an announcement that HBO/SHOW-TIME/The Movie Channel/HTN may have some competition on the bird should evoke only mild dis-interest. Below the surface the existing pay movie oriented programming firms are raging mad, threatening lawsuits and generally letting anyone and everyone know they are mad and won't stand for this. Why should there be this violent reaction to competition?

Let's go back to the movie biz just a minute. When a movie is released to theaters, the investors in the flick attempt to re-coup their bucks by charging whatever the tariff will bear. Let's assume just for discussion a low number like $4 a head for each participant that passes through the turnstyles and into the theater.

The movie folks are paranoid about gate security. They **know** people are dis-honest because they make movies about dis-honest people. They **know** people will attempt to steal their product because in Hollywood stealing is a way of life. They are also dis-trustful of their own close associates, the theater owners and operators, and routinely the movie distributors send out 'ringers' to inspect the methods in use by the theaters to sell tickets and collect fees for the showing of their product. In the past few years they have waged an on-going battle against pirating of their product and with the advent of videotape they have become extra sensitive about pirated dubs of their product and the worldwide distrubition of same; often concurrent with or even ahead of the time that they release the product initially to their captive theater chains.

One way they attempt to control security, which is another way of saying protect their gate, is to break up the theater release schedule in such a way that the movie initially only goes to those theaters where security is rated as high and where their recent-past experience tells them that the theater operator rates high in his own honesty of turning in the proper share of the gate proceeds to the distributors. These proceeds are themselves often a heavy portion of the total gate take; a $4 ticket may put as much as $3 into the pocket of the distributor/producer/releasing agent with but a buck staying at home for the theater owner/operator who provides the hall, does the advertising, and cleans up the mess in the balcony afterwards. Not all flicks demand 75% of the gate of course but a surprising number of them demand and get it. The theater operator is not in much of a position to haggle; he must have big name stars and highly publicized pictures to attract and crowd and pay his rent and the distributors know who is vulnerable and who is not. For the most part each film released carries its own bargaining schedule and the distributor/producer's agent is on the road with a 'window' in which he is authorized to make each deal. The higher he gets the theater operator in the 'window' the more his commission so there is ample incentive all the way around.

The good old days of renting a quality film for an indefinite run for a flat fee are gone and forgotten. Movie distributing, like movie making, is not your wholesome, All-American sport.

If the $4 ticket is the street price, the producers feel they have a period of time (a 'viewing window') during which they can command **that** price. This particular window may last 90 days for a flash in the pan film that never gets off the ground to 6 or even nine months for some biggie like Smokey. This window is the big ticket window...the period when the original movie investors get their highest return.

For the most part nobody has dared to tamper with this window or to broaden it. Everyone simply assumes that the first 3 to 9 months after a film is released, it is going to stay in the theater circuit and nobody else in the movie distributing business is going to get a crack at that film until **this** 'window closes'. In the real world, even if a film bombs after 90 days it stays in the theater circuit window for a full nine months as a minimum just because that is the policy.

Well, it has been the policy until recently. Then along came direct distribution of the movie on such new innovations as videotape and video disc. The success (however limited in truth) of Fotomat in distributing movies for either a rental fee (typically $8 to $15) or for sale (typically $60 up for a feature) has opened some Hollywood eyes. On the surface an $8 rental seems like a reasonable return for one person viewing except of course virtually every movie so distributed gets seen by many people and perhaps many times. That doesn't bother the Hollywood types too much as long as this occurs either at the close of the first nine month window or close enough to it sothat on the bottom line people aren't paying $8.00 to take a family to the show when the same family going to the theater would have to pay $16.

The value of any movie, for reasons best understood by the Hollywood hype people who create the demand for the flicks, is a direct function of the age of the film. Like a new car, value is highest the day the picture first hits the street and from that point onward the value decreases almost daily. The exception of course is the big film that starts off as a sleeper, builds an attraction simply because of its sheer excellence (as opposed to the hype that preceded its release) and like Smokey ends up being a big box office attraction.

In the Hollywood mentality each film has a half-life of perhaps 90 days and after that they begin to squirm, weighing the receipts to date against the initial costs of the feature and projecting when or even if they are going to come out.

Subscription (over the air) pay television and cable premium/pay television are new enough that nobody exactly knows how they fit into the initial theater release window yet. Let's see how the dollars work.

1)The theater goer puts down $4 and walks in and gets **one** seat. He might manage to sit through the same feature several times but that is uncommon. Usually he's had all he wants after one showing. The half-life of this ticket price is going to average 90 days but for'window' purposes it extends to 270 days (nine months). After that period of time we enter the next distribution phase for a picture.

2)Let's say HBO decides it wants our typical picture. They sit down with the producer/distributor and talk money. **HBO** offers them 20 cents per cable home connected to the network for unlimited showings. The distributor laughs and counters with 50 cents a home and 3 showings. Then HBO laughs and counters with 30 cents and 10 showings. They eventually settle on 40 cents per home and five showings in the initial release month and three more showings over the following 12 months.

3)Later, much later, the television **networks** come along and they sit down to dicker. $1,000,000 and three showings they start off. $2,000,000 and one showing is the counter. They settle on $1,500,000 and three showings. And a release window is established.

4)Finally there is the syndication of the film; putting it into some package with perhaps twenty other films and selling the whole package as a package to **individual** TV stations. The rates are sensitive to the size of the TV station's market, when it will show the films (the 'window' again) and how often the station wants to show the films.

This is not the end of the line but is is getting close. Ted Turner bought more than 3,000 film titles for unlimited showing several years ago, before he got onto the satellite with his WTCG/WTBS, and Turner keeps cranking those oldie but goodie films over and over for rental rates established back when he was a poor struggling UHF TV station serving Atlanta, Georgia and not much else; perhaps 50,000 homes.

With each step downward in the release window the security problem gets tougher. For all practical purposes once the feature is outside of the theater release window the security problem is too massive to even attempt to cover. It's one thing to worry about how many people are sneaking into a theater and 'costing' the movie distributors their $3 portion of the entry fee; it is something else to worry about how many people are videotaping the feature from their local cable service and then passing the tape around amongst friends.

Enter now the Getty Oil package once again. Getty and their four producer/distributor friends apparently want to play with the window. They are proposing to establish their own 'nine month window' during which the movie products from 20th Century-Fox, Paramount, MCA and Columbia will e available **only to their own** satellite delivered pay service. In other words, HBO and SHOWTIME and The Movie Channel can go suck eggs for nine months and wait until this new Getty funded pay / subscription service has shown and reshown the product as many times as they wish. Then HBO et al can have it.

HBO immediately cried foul ball. They don't know where that nine month window starts or ends. Does it begin after the theater window, or part way through it? In any event, it certainly would delay when features become available to HBO et al and to them that seems like a 'horizontal conspiracy' put together by a rich oil company and four large movie producers/distributors. Which of course is exactly what it is.

But is it illegal? Perhaps. Perhaps not.

HBO has had things its way for quite some time, gobbling up the vast majority of the cable firms who were potential affiliates. SHOWTIME has come on strong lately primarily after a Texas CATV system discovered that the gullible American public would in surprising numbers pay extra money to subscribe to **both** HBO **and** SHOWTIME if they were offered both at the same time. In fact something like 50-60% of the people who will subscribe to one $9.00 a month service have been signing up for **two $9.00 a month services** since this neat little discovery last fall. So now we have the latest generation of cable systems offering two different movie/premium service channels per month and half or more of the public offered the combo service plunking down more than $20 a month for 'basic cable' (the non-movie channels) **plus two** movie services.

This revelation has not fallen on deaf ears. Getty and the four Hollywood partners apparently got the message early. NOW - one way for them to edge their way into a marketplace is to (1) somehow withhold big name features for a while (which would make their service where the features **would be appearing** early stand out!), and then (2) see to it that the largest cable firms in the country were given every opportunity to carry the new Getty funded service.

Which brings us to the fine tuning. Naturally 'the cable TV bird' is full; SATCOM FI can't handle anymore programmers and FIII is not due up (again) until late in the fall of 1981. So Getty went to SPN's Ed Taylor and offered a deal Taylor could not refuse. It looks like this (subject to the inevitable fine tuning):

1)Taylor's Satellite Program Network on FI transonder 21 will cut back to 50% of the day starting next January 1st. Taylor will shift some undetermined amount of SPN over to the new COMSTAR D2 bird (transponder 13V).

2)In that 50% of the day pre-empted, or from approximately 7 PM eastern to 4 AM eastern Monday through Thursday, longer on weekends, the new Getty funded pay TV service will take over transponder 21 on SAT¶ COM FI.

3)Taylor, mindful of his investment in SPN will meanwhile

be looking for ways to make COMSTAR D2 fly. At the moment there continues to be considerable reluctance in the cable industry to make the investment in a second antenna/terminal for the new bird.

Alas, all of this energy is in reality the latest in a long series of cable industry Chess moves. The players keep changing, their moves keep getting more and more elaborate and because they are the primary programmers on the satellite these days all who have an interest in the satellites are forced to keep at least a talking knowledge of their activities. We'll keep you informed.

ADDITIONAL UPDATE ON INTELSAT OPERATIONS

Since SPTS-80 Miami, many enthusiasts are attempting their own reception from the international series communications satellites. Operated by the 100-plus member Intelsat (International Telecommunications Satellite Consortium), the global system carries the majority of international telephone, telegraph, data and television traffic across the world's three major ocean regions. The system was designed for **this** purpose, down to the parameters of the satellite transponders and the geostationary locations allocated. In recent years a new use has come along: many nations of the world have realised the value of leasing capacity from Intelsat for their own domestic needs, in preference to buying outright a space segment of their own. Were it not for this 'new' use of the Intelsat spacecraft, there would be little carried by them of interest to the experimenter.

So what satellites should we take an interest in? Since Early Bird (Intelsat I) in 1965, there have been several generations of Intelsats. At present, two types are in use, the 12-transponder Intelsat IV series and the expanded capacity, 20 transponder Intelsat IV**A**. There are, at various locations around the orbit, 12 serviceable birds, 7 of type IV and 5 of type IV**A**. The main routes are generally served by one or more IVA's, while the IVs act as reserves **or** are designated for **domestic lease service only.**

In the Atlantic region, the following orbital slots and designations apply:

1°W	Intelsat IV F7	domestic lease service only
2.6°W	Intelsat IV F2	reserve
18.5°W	Intelsat IV F1/F3	Major Path 2 and lease service
24.6°W	Intelsat IVA F1	Primary Path
27.5°W	Intelsat IVA F2	contingency and lease service
34.5°W	Intelsat IVA F3	Major Path 1 and lease service.

Indian Ocean services are provided by:

57°E	Intelsat IV F5	available for lease service
57°E	Intelsat IVA F3	contingency and lease service
63°E	Intelsat IVA F6	Primary Path

And over the western Pacific:

177°E	Intelsat IV F8	Primary Path
179°W	Intelsat IV F4	reserve

The designations speak for themselves, though they may be changed from time to time to meet operational requirements, so should not be regarded as permanent. The orbital locations though are the ones allocated to Intelsat, and future birds will occupy nearby slots, if not the same traffic status. The **next generation** of Intelsats is the series **V** (five), the first launch of which is scheduled for September of this year (F2) with F1 (paradoxically) getting a December launch. Both of these will be positioned over the Atlantic, taking over Primary Path and Major Path 1 service from the existing IVAs. Two further Intelsat Vs, as Major Path 2 and a reserve, will be launched for the Atlantic region in 1981, together with further launches to serve Indian and Pacific Ocean regions.

Satellites in View

In the United States, you can sample Intelsat traffic in most places. The difficult spots are all of Montana and Utah, most of Idaho, Wyoming and Arizona, and parts of Nevada, New Mexico and Colorado, where all Intelsats are below 5 degrees elevation, as shown in **diagram 1**. The eastern states have the best selection, four Atlantic birds being visible. The principal US Intelsat terminal is located at Etam, West Virginia, with a diversity antenna located 22 miles northeast at Lenox, to combat weather-related atmospheric attenuation on the 14/11 GHz bands to be used by Intelsat V in addition to 6/4 GHz.

Having got an Intelsat in view, it should be remembered that, since Intelsat terminals are automatically steered, the satellites don't need to be maintained on station to quite the degree of accuracy required for a domestic domsat, and may be allowed to drift as much as 2 degrees before being corrected. All it means is that, with a high gain antenna fixed with boresight onto an Intelsat, the signal strength may well fall over a period of days, requiring re-peaking on the bird's signals.

Footprints

I often get requests for details of Intelsat footprints. The great flexibility of the Intelsat space segment makes a mockery of fixed footprint maps. For instance, Intelsat IV type spacecraft carry conical horn antennas for global coverage (17° beamwidcth to 3-dB points) and a **pair** of steerable paraboloid dishes to generate spot beams of 4.5° 3-dB beamwidth, which may be aimed to **any** point on the visible earth's surface. **Diagram 2** shows three **possible** aimings of spot beam coverage from an Atlantic Intelsat **IV**. These spot beams have some 11.5 dB gain over the global beam antennas, and are comparable with the US domestic footprint EIRPs. It will be realised that the 34 dBW is the saturated **beam-edge** value - **beam center EIRP is 3 dB higher**, but any back-off from saturation will **reduce** the EIRP.

The Intelsat IV spot-beams are ideal for communication with small terminals, which is one reason why the remaining **IVs** are **preferred** for **domestic lease service**, where typically TV programmes are distributed from one central point to several regional centers, each equipped with a small receive-only terminal, of perhaps 4.5 or 6 meters aperture. On an Intelsat **IV**, 4 transponders are tied to global beam transmitting antennas while the other eight are switchable by ground command between global beam and one of the two (east or west) spotbeam antennas. This arrangement has its disadvantages in that each spot beam can only look in one direction at a time. This meant that the spot beam capability was under-used on most of the Intelsat IVs and most of the switchable transponders **remained on** global beam of 22.5 dB EIRP.

When it became apparent that Intelsat V dual band system would not be ready before the end of Intelsat IV's useful life, a 'stop-gap' satellite was designed, based on the Intesat IV but with increased capacity thanks to **frequency re-use** within the 4 GHz band. At the same time the beam-switching facilities were improved to make the higher-EIRP beams more efficiently usable. The **four** 'global-beam-only' transponders were retained, but Intelsat **IVA** carried **eight extra transponders**, so that both eastern **and**

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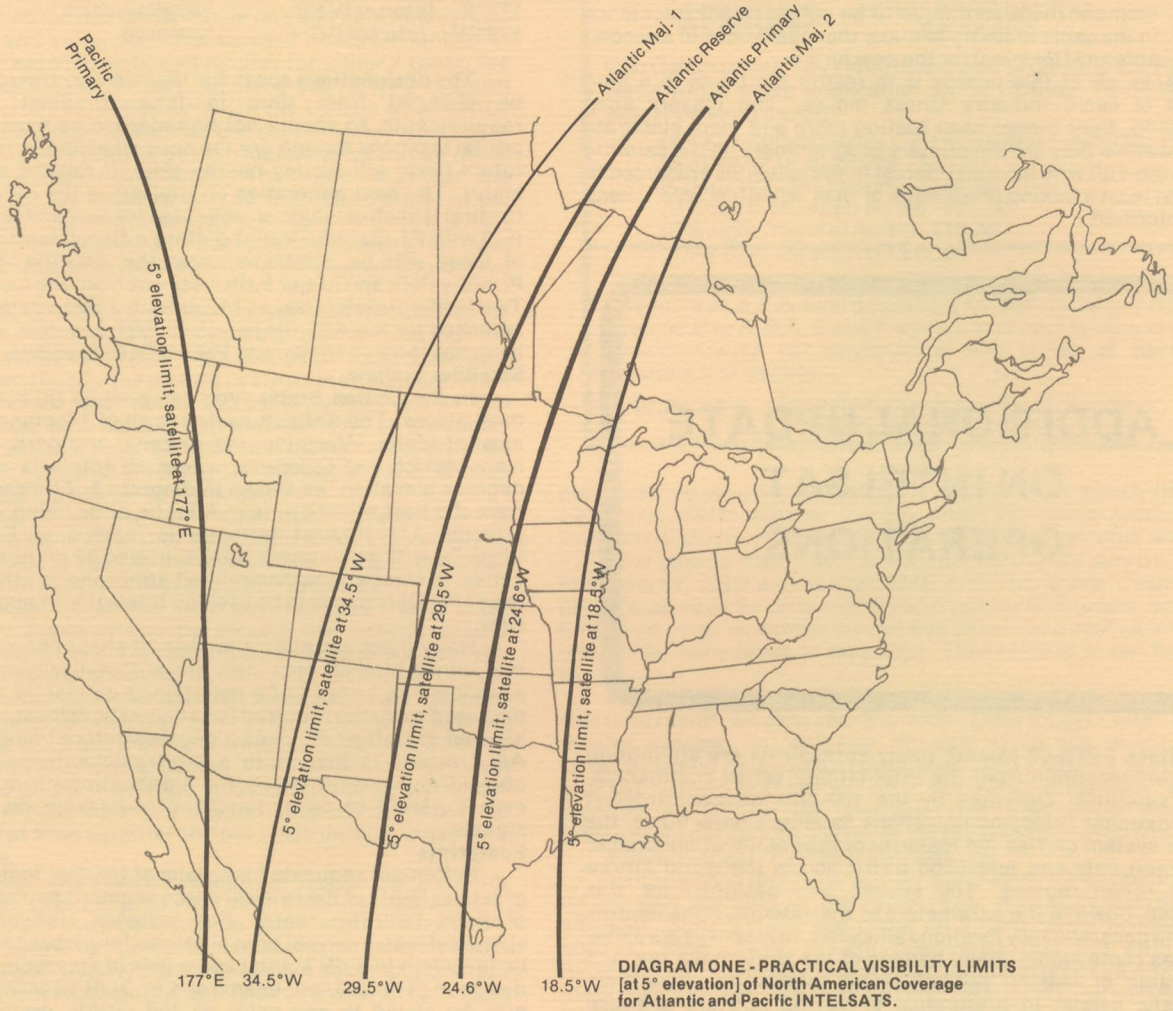


DIAGRAM ONE - PRACTICAL VISIBILITY LIMITS [at 5° elevation] of North American Coverage for Atlantic and Pacific INTELSATS.

western areas could be simultaneously covered using the **same** channel frequencies. The emphasis was placed on **hemispheric** beams, east and west, with the option to select **steerable spot beams**, though of lower gain (wider beam but lower EIRP) than the Intelsat IV spot beams. Comparing the two systems:

Intelsat IV:

4 transponders global beam only	EIRP 22.5 dBW
4 transponders global or west spot beam	EIRP 22.5 **or 34.0 dBW**
4 transponders global or east spot beam	EIRP 22.5 **34.0 dBW**

Intelsat IVA:

4 transponders global beam only	EIRP 22 dBW
8 transponders west hemi or spot beam	EIRP 26 or 29 dBW
8 transponders east hemi or spot beam	EIRP 26 or 29 dBW

-these EIRP figures again being beam-**edge**, saturated transponder values.

Diagram 3 shows the shape of the Intelsat IVA hemispheric beams for the Atlantic region, superimposed on a view of the earth as seen from 22,300 miles above a point on the equator at 24.6°W, the location of the Atlantic Primary Path satellite. The Indian Ocean footprints are shown in **diagram 4.**

With advent of Intelsat V later this year, a further level of frequency re-use will be added. In addition to the east and west beam separation, the same frequencies will be re-used in the same geographical areas by cross-polarising the hemispheric and zone beams (actually **opposite senses** of circular polarisation). **Diagram 5** shows the arrangement for again the 24.6°W Primary Path slot. **When** this comes into effect, there will be no possibility of using the signals **without** the **correct** circular polarisation feed, as a **linear feed** will be **unable** to separate the two cross-polarised transponders within the overlap zones. (**At present** all signals use **right-hand circular** polarisation). Also on diagram 5 can be seen the 11 GHz spot beams, aimed to encompass the locations of the heavy traffic Type C terminals operating in the 14/11 GHz bands (circuits between Europe and North America).

Frequency Plan

In diagram 6 I have compared transponder frequency assignments of the world's major 4 GHz downlink satellite systems. First the familiar domestic channels, the basic 12 as used by Anik and Westar, and the alternate-numbered cross-polarised 24 in the Satcom and Comstar arrangement. For comparison, I have also included the 6-channel, 50 MHz spacing Soviet system assignments, though **many** of their TV satellites are **only** active **on channel 5.**

The fifth group is the Intelsat plan. Unlike the domestic 12-channel arrangement, **telemetry** carriers are inserted **at band center**, between channels 6 **and** 7, thus moving the channel center frequencies away from those of the domsats.

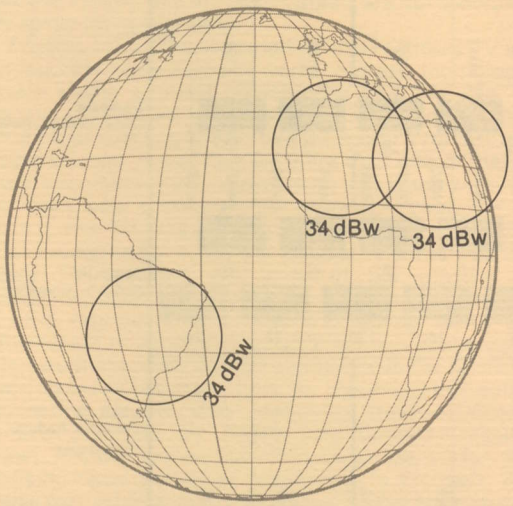


DIAGRAM TWO - INTELSAT IV TYPE SPOT BEAMS
(Possible footprints from Atlantic Satellite)

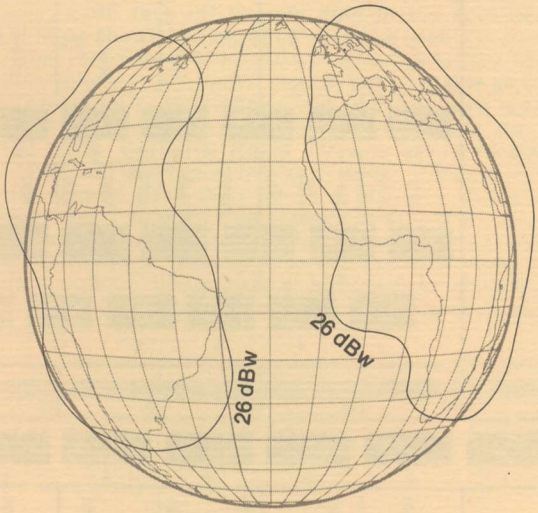


DIAGRAM THREE - INTELSAT IVA HEMISPHERIC BEAMS
(Atlantic Primary Satellite at 24.6°W)

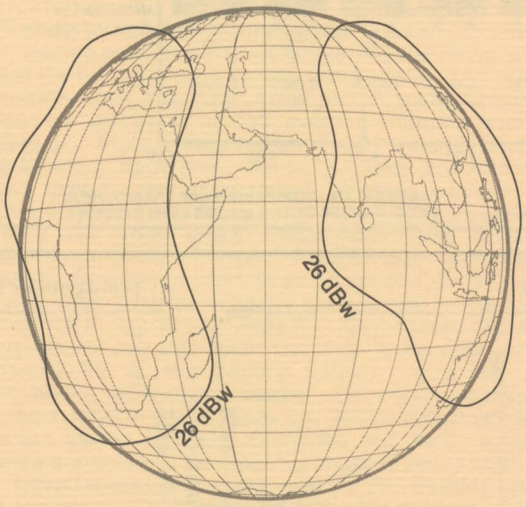


DIAGRAM FOUR - INTELSAT IVA HEMISPHERIC BEAMS
(Indian Ocean Satellite at 60°E)

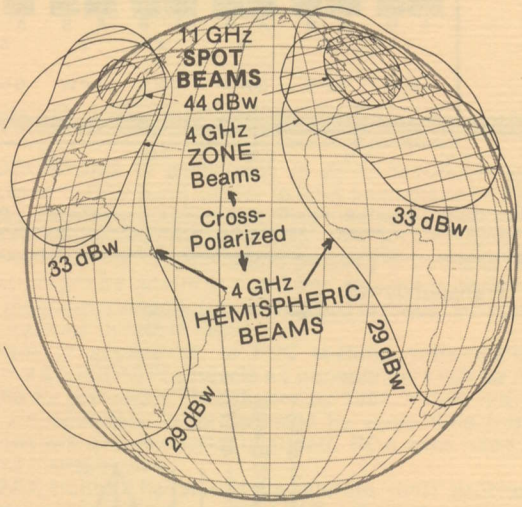
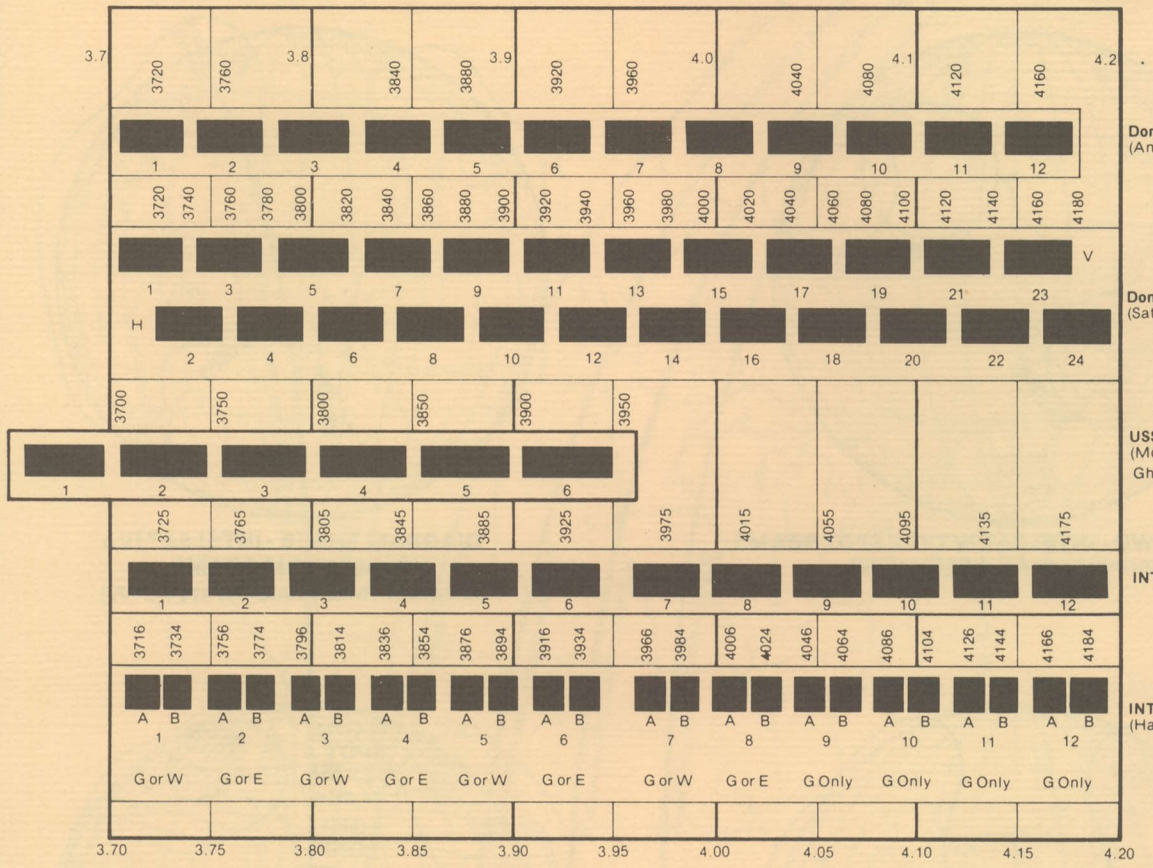


DIAGRAM FIVE - INTELSAT V FOOTPRINTS
(Atlantic Primary Satellite at 24.6°W)

Since the adoption of half-transponder working for television, the TV channel **center** frequencies assume perhaps more importance **than** transponder frequencies. For this reason the pattern is repeated, but divided into half-transponders, with TV carrier frequencies shown. Also in this lowest group is the identification of **which** Intelsat IV transponders can be **switched** from global beam **to** east or west spot beams.

Looking within the 36 MHz transponder bandwidth (**diagram 7**) we can see the effect of half-transponder TV working. A common arrangement in 'full-transponder' TV was to locate the TVcarrier **3 MHz above channel center** and limit its bandwidth to a total of 30 MHz, leaving 6 MHz free to be used for cue circuits, engineering order wire circuits, and the all-important audio carrier or carriers. **With half-transponder TV**, TV channel bandwidth is maximised at 17.5 MHz, leaving only a 1 MHz guard channel between the 2 TV signals (of course, the other half of the transponder need not also be carrying TV, but a guard channel is still required.) One consequence of this is that now there's no room for (SCPC) audio. Particularly with leased channels (multiples of one quarter transponder) it's hard to fit the TV sound in anywhere else, so **increasingly** it is being **combined with** the video, usually in the subcarrier form familiar to domsat users. Popular subcarrier frequencies seem to be in the 5.8 or 6.55-6.65 MHz region. This of course makes our task easier, as we don't have to search around the edges of the transponder, or even other transponders, to find the audio.

Another consequence of half-transponder TV is that the full power is no longer available for the TV signal. Assuming two **identical** transmissions, each would claim **half** the **available** RF power, less a 'back-off' to reduce intermodulation between carriers to an acceptable value. So each TV signal must operate with a power perhaps **4 dB below saturation**, reducing for example Intelsat IVA global beam EIRP to 18 dBW, which sounds like a long way down. Some (but not all) of this loss can be recovered by optimising receiver bandwidth



Note: G = Global, E = eastern hemispheric, W = western hemispheric **Downlink Frequency** (GHz)

DIAGRAM SIX - COMPARISON OF TRANSPONDER FREQUENCIES OF THE MAJOR 4 GHz SYSTEMS

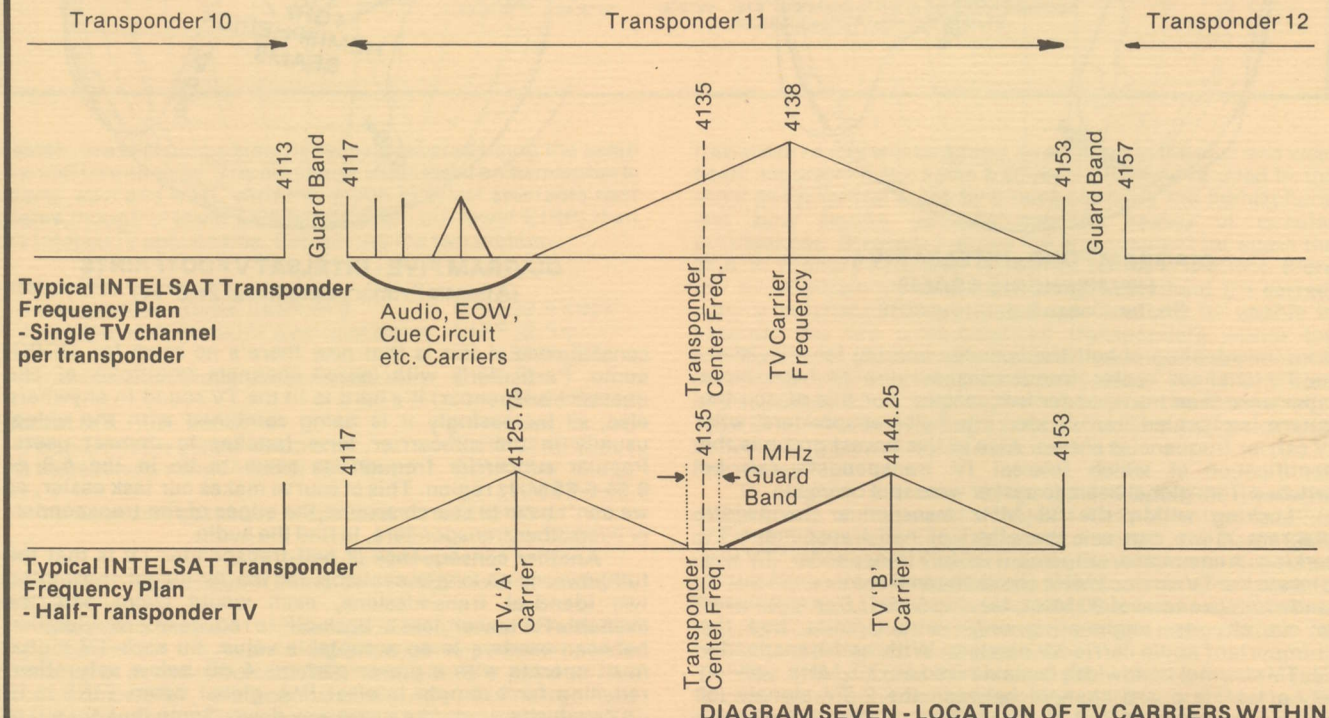


DIAGRAM SEVEN - LOCATION OF TV CARRIERS WITHIN TRANSPONDER BANDWIDTH

for the half-transponder format. I think **some** leased-transponder operators may have retained an option for full-transponder TV **for this reason**, but my observations are not conclusive.

TV Programming Available

Traditionally, 'live via satellite' international TV was used for immediate news items of world interest, including reports on state visits, summit conferences and the like, for live coverage of manned space exploration, and for the major international sporting events like the soccer World Cup and the Olympic Games. It was rare for more than one of these events to occur simultaneously, so provision was made within Intelsat for a main and a reserve TV channel. When TV was not required, the TV transponders would be available for other traffic. **Transponder 12 on the Intelsat IV birds** was made the **primary TV channel**, and most of the world's member terminals were equipped to handle TV signals **on this channel.** The next regular user of the TV facility came with the establishment of various international news exchanges. Items of international appeal would be provided to the satellite circuit by various broadcasters in turn, for recording and subsequent broadcasting by interested members. News services of this type are provided by Spain (the Ibero-American News Service), France (to locations throughout the world), Italy (the Eurovision news exchange originating in Brussels, Belgium, and also carried frequently by Russia's Intersputnik network), Visnes of London, England to destinations in the Far East and Middle East, and UPITN (news packages from the US to Japan five days per week).

Full-Time Leasing

In 1973, Intelsat began leasing satellite transponder capacity for domestic communications services. The low rates, (currently around $800,000 per transponder for 5 year contracts), combined with the low cost of small terminals made such leasing economically attractive to developing countries. One of the first to use the facility was Nigeria, with upwards of 20 stations linked through three leased transponders on the 'lease only' Intelsat IV at 1°W, over the Atlantic. Other African lessees are Algeria (one Indian Ocean transponder), Sudan (one Atlantic), Zaire (one Atlantic), Uganda (one Atlantic), and Egypt (one-**quarter** transonder). Further eastward, Saudi Arabia leases two and a quarter Atlantic transponders, and Oman a half Indian Ocean transponder. Also in the Indian Ocean region is India (¼ tpdr). Pacific leases are held by Malaysia (1), the Philippines (1½) and Australia (2 transponders). Norway uses Atlantic capacity to maintain communications with its North Sea oil platforms (½ tpdr), France has ¾ Indian to provide its link with Saint Denis de la Reunion, and Spain transmits TV to the Canary Islands via a half Atlantic transponder. Greenland leases for communications with Denmark, and in South America, Atlantic quarter-transponders are leased to Chile, Colombia and Peru, while Brazil leases a massive 2½-transponder chunk of space segment.

Not all these leasings are used for TV - **nothing less than** a half-transponder **can accommodate** a TV channel - but where TV programs are carried they can be relied upon to be more or less permanently available. Contingencies may demand transfer to a different satellite in the same Ocean region, but the transponder frequency will in general remain the same. (Frequency-agile receivers are the **exception** out there in bush-terminal land - it's one thing to move the antenna onto the next bird, five degrees away, quite another to equip 20 remote stations for a **new** channel frequency!) It's not possible to give complete listings of what services to find on which transponder on which bird, but having the list of Intelsats visible from your location, and having a fully tunable receiver such as described in STT's various manuals, it's not too much of a problem (and can be a lot of fun) to acquire each available bird in turn and run through the 3.7 - 4.2 GHz band, noting what is available at each tune point for future use. It may be necessary to stick with a TV channel for an hour or two to positively identify its source, but it's worth the effort. Don't be surprised if there's **only one or two TV channels** on each satellite - these will probably be the permanent ones, the 'occasional video' transponders being in use for other traffic. Realise also that the 'opposite hemisphere' beam (Intelsat IVA) to the one you're in can never be received, so if for instance you're in the USA **and receiving** TV aimed at an **African** destination, it'll most likely be **a global** beam. Similarly, EIRP falls off sharply outside the spot beams - none of those shown in diagram 2 would be usable in the USA. Also, what I see here in Sheffield will include a large amount of east hemisphere IVA Atlantic beams, **not available** across the pond. American experimenters will likewise have access to services I've never seen, though we may view the same Atlantic birds. Certainly Brazil TV was easily received at SPTS-80 Miami (see report in March issue). Readers in Africa and the Middle East should find a plentiful choice of TV programs, but I suggest they make a search of the available channels to find out what is available at **their** location. **CSD** will publish all findings. (I believe there are several sophisticated 'private terminals' in the wealthy Middle-East oil states, that are even now used **just for viewing** the variety of Intelsat TV programs.)

BIRD OPERATIONAL NOTES

DECISIONS to participate in direct-broadcast satellite services in 12 GHz band appear to have been made by Finland, Norway, Denmark and Sweden. Proposed service would have 8 channels operational for these countries; an additional five to cover Iceland, Faroe Islands and **possibly** Greenland. Service to latter might be 'above horizon' and at useable level in parts of northeastern Canada. If final decision is made, service could be operational by late in 1985.

RCA in application to FCC seeking authorization for launch of SATCOM IV **projects** 44 transponders will be needed fulltime for just cable TV industry by 1984. When number of video transponders to be required by same time frame for broadcasters and networks is added, RCA sees need for 80 fulltime transponders.

OAK claims it has solved the satellite 'theft' problem; has demonstrated system on WESTAR which it says will cost uplink site between $5,000 and $50,000 per video channel; will cost each downlink terminal between $500 and $1,000. OAK suggests prototype gear available by end of 1980; full production by end of 1981. System works by addressing decoders at specific locations (via satellite fed signal).

PBS may launch test of direct satellite fed translators from WESTAR I fed channels in state on Montana before year is out. Decision is close, likely.

AFTER SEARS and COMSAT fell apart there has been speculation that COMSAT will try to announce a replacement partner for much-promoted DBS bird system. Current rumors include Montgomery Wards and Radio Shack in list of potential partners.

TED TURNER's Cable News Network ready to begin service on temporary transponder 14 home on FI June 1st with first 24 hour per day news service. Previous **speculation** that transponders 15 or 19 might be utilized for service apparently incorrect; transponder 15 is most heavily loaded SCPC/data/audio satellite channel in sky these days involving hundreds of customers; transponder 19 has previously unreported 'noise problem' and is not capable of handling video service. Transponder 14 may be a bummer none the less - in past it has

been intermittent.

SAME INTERMITTENT problem has been cropping up repeatedly on Trinity's transponder 13; may be combination of unfortunate uplink transmitter plus bird problems. Occasional outages on transponder 5 of late are apparently result of uplink transmitter, not bird itself.

UNKNOWN California firm called Orrox Corporation (Santa Clara) reportedly has received license from NHK Japan to produce 12 GHz receive terminal electronics; they say packages will sell in "$300-$500 range...".

LATEST new programming service to announce plans to package materials for cable market is Las Vegas Satellite Network. Firm plans September start, will provide 3 hours per day of programs live and taped from LV nightspots; format would be on COMSTAR D2 transponder 19 (V).

SCRATCH one of the 'lucky' firms to 'win' a COMSTAR D2 transponder in RCA lottery; Total Communications won transponder 22 (H) in April drawing, subsequently has 'sold' rights to it to Warner-AMEX (operator of The Movie Channel, KTVU and Nickelodeon on FI).

QUESTION. When are all of these D2 programmers likely to start service? Best bets are late fall before anyone shows up there on **regular** basis. Some 'tests' are likely before then, but don't expect **much** activity on D2 before early in 1981. Remember all of those who ended up there are simply biding time (and paying rent) until RCA gets the FIII replacement up and operating late in 1981.

STRANGE press-release announcement from Scientific-Atlanta, after firm bowed out of 'home TVRO system sales' last fall. They have named new "Video Products Division" to handle marketing of earth stations to "...hotels/motels, hospitals **and homeowners**...".

WASHINGTON, D. C. gets its first fulltime Spanish language television this month; via satellite. Channel 56 UHF translator (1 kW) will pick off WESTAR II SIN feed and rebroadcast in market.

NEW NAME for Madison Square Garden Events/ Calliope (children's network) is USA NETWORK. Service on transponder 9 has been on for several years, will expand to 'routine 8 hour day' in September.

NEW national satellite delivered 'all sports radio network' called Enterprise Radio will become available early 1981 according to announcement. Service will be on a yet-unnamed WESTAR satellite (SCPC) will use two audio channels, package 800 number toll free call-in sports talk shows with live coverage of sporting events plus pair of detailed sporting newscasts per hour.

YOUR neighborhood Holiday INN, now carrying HBO via satellite, is adding WTBS for off-HBO hours and is negotiating with ESPN for transponder 7's all sports coverage.

SUGAR RAY LEONARD-DURAN fight scheduled for June 20th one of best kept satellite secrets in years. Fight will be sent via satellite, reportedly will be carried by at least Columbus, Ohio CATV ystem (for a per-event fee). Terminal operators in Bahamas, elsewhere tried without success to contact promoters to buy rights to exhibition in their country.

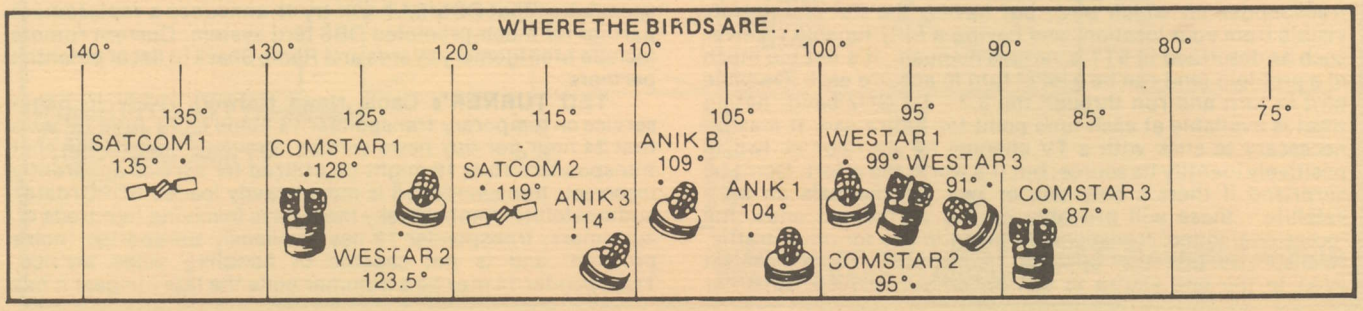
JUNE CES (Consumer Electronics Show) in Chicago will have at least two TVRO terminals operating as exhibits; first opportunity for many of the nation's retail electronic dealers/distributors to witness what the private terminal revolution is all about.

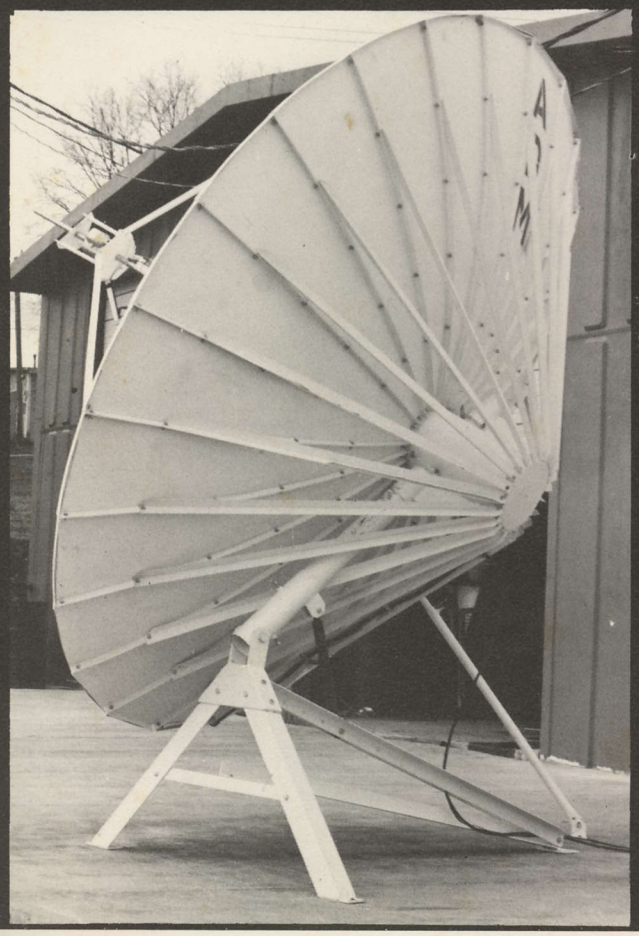
IN SURPRISE announcement CBS Network said it was expecting to create a special cable television division, might even create a special cable program **network** for distribution via satellite. One week after surprise announcement the CBS executive who made the announcement was suddenly dismissed from job. Two may not be related.

JUNE 9th is start date for new Independent News Network (INN) chaired by New York City's WPIX. News feeds from 9:30 to 10:00 PM eastern via WESTAR satellite link weekdays will likely air in local markets after 10:00 PM.

INDEFATIGABLE Fred Hopengarten of high-dollar TVRO distributor 'Channel One' continues to find his way into headlines. First he agreed to argue on panel at mid-May National Cable Television Association convention that everyone has a legal right to '**steal**' anything on satellites he wishes; NCTA back peddled shortly after announcing Hopengarten appearance deciding they didn't want to give him any forum for his views. Then June issue of **RADIO ELECTRONICS** carries error-filled one page article by him reporting (among other mistakes) that motorized TVRO antennas are **very** expensive, antennas **must** be shielded from wind 'because they are like sails', that if you want to operate as a CATV system you **must** have frequency coordination for your terminal, and that to add a second receiver to a terminal you **must** add a second LNA.

Quick-Satellite-Facts: Audio subcarriers currently in use on SATCOM FI are as follows. Transponder **3** - WFMT (stereo clasical music) is on 5.8 MHz. Transponder **6** - UPI News and Slow Scan is on 6.2 MHz while Easy Listening Music is on 7.4 MHz. Transponder **21** - The Disco Network is on 5.8 MHz while Seeburg Background Music is on 7.4 MHz. **Program control tones** are as follows: Transponder **5** (Movie Channel) turns on east/central receivers with 311 * # and west with 519 * #. Transponder **9** (Madison Square Garden Sports) turns on with 438 * #; Calliope turns on with 168 * #; C-SPAN turns on with 195 * #; and, BET (Black Entertainment Television) turns on with 018 * #. Transponder **10** (Showtime) turns on with 576 * #. Transponder **11** (Nickelodeon) turns on with 749 * #. Tranponder **12** (Showtime) turns on with 576 * #. The Mini-Pay service (Front Row) on transponders 10 and 12 turns on with 481 * #. On transponder **21** SPN utilizes 429 * # while HTN (Home Theater Network, 8-10 PM eastern) utilizes 207 * #. On transponder **22** Modern Satellite Network utilizes 421 * # while HBO (west) utilizes 835 *#. On transponder **23** (HBO's Take-2), they use 529 * # for the eastern two time zones and 681 * # for the western two times zones. Transponder **24** (HBO east) utilizes 835 * #. RCA owned and operated uplinks include Atlanta (not supposed to have video although it has been seen). Vernon Valley (N.J.), Chicago (Lake Geneva), Los Angeles (South Mountain), San Francisco (Point Arena), and Houston. Western Union owned and operated uplinks include Glenwood (N.J.), Chicago (Lake Geneva), Los Angeles, San Francisco, Dallas, Seattle, Phoenix, Atlanta and Honolulu. ATT-GTE uplinks include New York City, Chicago, Tampa, Atlanta, Honolulu, San Francisco and Los Angeles. PBS uplinks include Washington, D.C., Denver, Columbia (S.C.), Lincoln (NB), Hartford (CT) and Talahassee (FL). Independent uplinks include Appalachian Regional Commission (Lexington, KY), C-SPAN (Washington, D.C.), ESPN (Bristol, CT.), Southern Satellite Systems (Atlanta, GA), SIN/Galavision (Los Angeles), CBN (Virginia Beach, VA), PTL (Charlotte, NC), Satellite Systems (Buffalo, NY), KTBN/Trinity (Los Angeles and SIN (San Antonio, TX).





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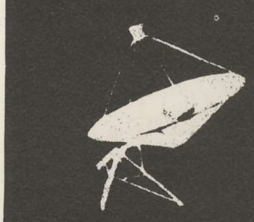

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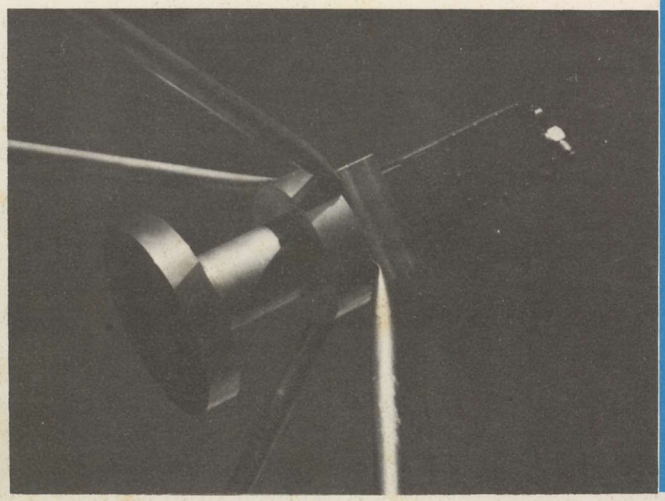

10 FOOT ANTENNA - The model 1016 is a sixteen section 10.5 foot diameter antenna having a gain of 39.5 dBi at 4.0 GHz with the Chaparral Feed (see below). Including polar mount, Chaparral Feed **and** polarization rotator. Extender petals increase the diameter to 12 feet and increase the gain by 0.9 dB.

12 FOOT ANTENNA - The model 1218 is an eighteen section 12.0 foot diameter antenna having a gain of 41.1 dBi at 4.0 GHz with the Chaparral Feed (see below). Including polar mount, Chaparral Feed **and** polarization rotator. Extender panels increase the diameter to 14 feet and increase the gain by 0.9 dB.

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